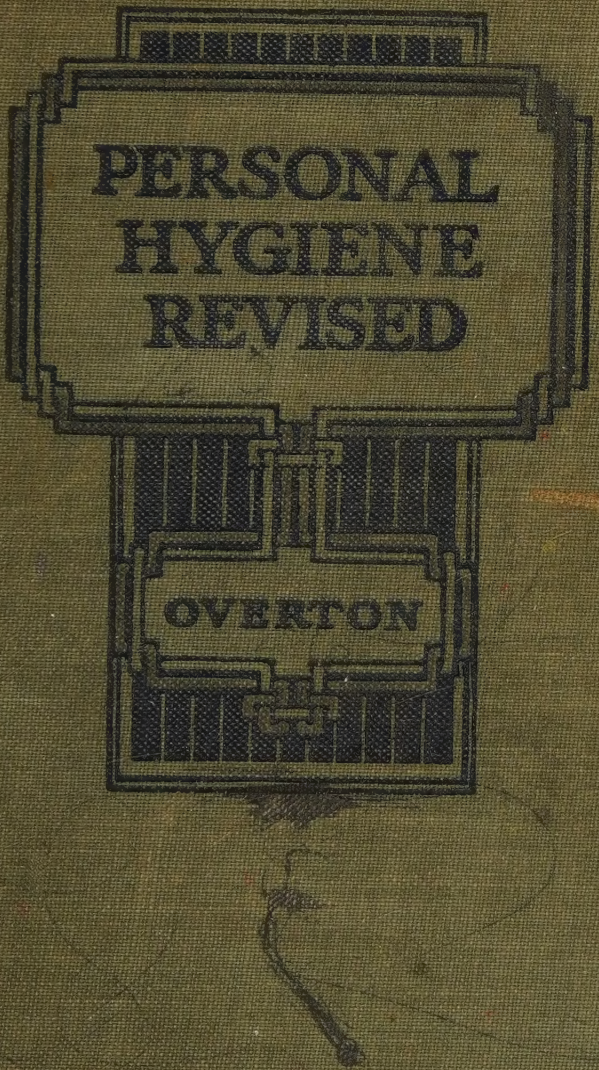
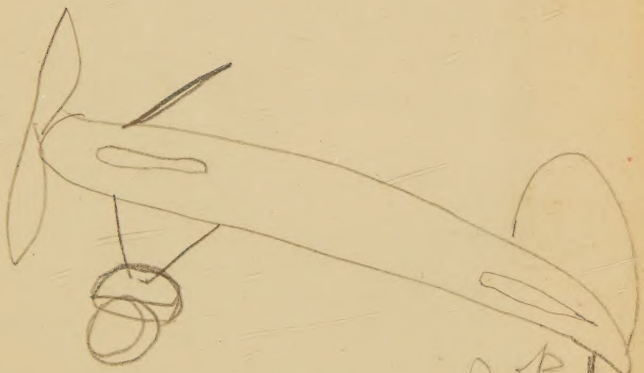
PERSONAL HYGIENE REVISED





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Frontispiece

LIVING MACHINES IN ACTION: EXERCISE THAT IS HEALTHFUL AND USEFUL

PERSONAL HYGIENE

REVISED

BY

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PREFACE

HEALTH education in public schools has been standardized during the past ten years. Modern syllabi in hygiene emphasize the practice of healthful living by the pupils, and dwell on those topics which can be put to daily use in daily life. This book conforms to the standard syllabi in recognizing three groups of topics, which require three different methods of instruction, and which may be briefly designated as those of scientific information, health habits, and civic conditions.

The topics of the first group are items of scientific information, and are designed to be imparted by the method of classroom instruction. They cover all the basic actions of the body and include demonstrations and practical applications of the principles in useful ways, such as stopping bleeding and cleansing the nose. This scientific information is at the basis of all hygienic instruction, and will enable a pupil to read hygienic literature intelligently later in life.

The topics of the second group are health habits and health chores which are practiced daily by the pupils, such as posture, exercise, personal cleanliness, and

habits of personal thought and speech. While these topics are based on scientific facts which may be briefly stated, yet their practice is secured principally by reiterated advice and constant supervision by the teacher as occasion arises.

The topics of the third group are conditions of a civic nature which the pupils observe. They include such subjects as heating, ventilation, lighting, and cleanliness of the schoolroom, and the prevention of infectious diseases among the pupils. The teacher imparts information in these topics largely by calling the pupils' attention to actual conditions, and by showing which ones are to be commended and which condemned. References to points to be observed are made in the text of this book and in suggestions to the teacher at the end of each chapter.

The book embodies the experience of the author as a physician and health official constantly in intimate contact with people of all classes, and especially concerned with the subjects in which they need instruction in order to prevent diseases, correct defects, and live efficiently. A simple, direct style of English, and the use of short, common words, make the book readily understandable by young pupils.

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PERSONAL HYGIENE

LEAPFROG

Happy play promotes health and strength.

CHAPTER I

THE STUDY OF HYGIENE

Good Health. — Sometimes you are bright and cheerful, and are ready for work or play. You feel comfortable and at ease in every part of your body. You do not readily become tired, and you enjoy your tasks as if they were play. When you feel and act like this, we say that you are in *good health*, or are well.

Sometimes you are dull and gloomy, and do not feel like stirring. You have pains and aches, and cannot help thinking about your uncomfortable feelings. You are too tired to work. Playing is a hard task, and even a rest does not help you. When you feel like this, we say that you are in *poor health*, or are sick.

You can keep yourself in good health without great cost or trouble. Your body is a living machine which will work perfectly if you take good care of it. When you do not feel well and cannot work or play, the reason usually is that you have not given your body proper care.

A Strong Mind. — You are something more than a living machine. You have a mind as well as a body. Some persons with strong and healthy bodies fail in their work because they do not have good minds; but many persons with fine minds cannot work because their bodies are weak and sickly. Anything that harms your body is likely to harm your mind also. For example, after you have eaten too much dinner, you will feel too dull and stupid to study; a headache or a toothache will keep you from thinking about anything except your pain; and when you have a bad cold or a fever, you may feel too sick to think at all. You go to school in order to train your mind, but you cannot have a strong and bright mind unless you learn to care for your body also.

Health and Good Looks. — It is well for you to be as good-looking as possible, in order that your appear-

ance may please other persons. A shapely face, blue eyes, wavy hair, and round cheeks will not give you pleasing looks if you are not in good health. Pleasing looks come from a fair skin, rosy cheeks, a pleasant

APPLE BLOSSOMS AND THE BLOOM OF HEALTH

The children are as healthy as they look.

smile, sparkling eyes, and a happy face, and these come from good health. If you have a headache, a scowl or a pout will take the place of a smile. If your body is weak, you will easily become tired and you will look dull and sleepy. You cannot have pleasing looks unless you feel well.

Sickness. — After you have worked or played hard, you may have tired feelings which seem like the feelings of sickness; but if your body is sound, a short rest will put it in order again. Sickness means a disorder which a rest of a few hours will not repair.

Nearly every man, woman, and child is sick for several days in each year. But there is less sickness now than there used to be, and there will be still less sickness in years to come, for people are learning more and more about the care of their bodies. A doctor has to study for many years before he can cure diseases, but a school child can easily learn how the common diseases are caused, and how they may be prevented.

Hygiene. — The study of caring for the body is called *hygiene* (hī′jĭ-ēn). When you study hygiene, you learn about such things as how to keep your body clean, what to eat and drink, how to care for a wound, how to take exercise, and how to keep the air of a room fresh and pure.

In order to understand the care of your body, you must study about what goes on inside of it. This study is called *physiology*. In it you will study about such things as how food is digested, how blood flows through the body, and how breathing takes place. If you wish to have a bright mind, a sound body, and good looks, or if you wish to have strength to do great deeds, you will study hygiene and physiology, and will practice the lessons which you learn.

QUESTIONS

What is meant by *good health?*

In what way may an unhealthy body prevent the mind from doing good work?

In what way will a healthy body help your good looks?

What is *sickness?*

What is the study of the care of the body called?

What are some of the subjects which are studied in hygiene?

What is *physiology?*

What are some of the subjects which are studied in physiology?

For the Teacher. — Why should any one try to be well and strong? Three answers are usually given:

1. In order to look well.
2. In order to be physically strong.
3. In order to be cheerful, mentally active, and able to work efficiently

Vigor and strength of both mind and body depend on the care of the machinery of the body. How many pupils in the class have been absent during the past week because they were sick or over-tired? In how many instances was the absence the result of sitting up too late? of wrong eating? In how many instances could the sickness have been easily prevented?

Impress the pupils with their personal responsibility for their own strength and vigor.

CHAPTER II

DISEASE GERMS

Causes of Disease. — Diseases are divided into two classes:

1. Those which can be caught from other persons.
2. Those which cannot be caught from other persons.

Some diseases spread from one person to another, like a fire. They are caused by something which passes from those who are sick to those who are well. Measles is an example of a disease which spreads from one person to another. If any one has measles, it is because he has caught the disease from some one who had (or has) measles. Over half of the people who are sick have caught their diseases from other sick persons.

Infectious Diseases. — Those diseases which are caught from other persons are called *infec'tious* diseases, and some of them are commonly known as *conta'gious* diseases. All of them are called *commu'nicable* diseases, because they can be communicated, or spread, from one person to another. They are caused by tiny living things, called *disease germs*, which grow in the body. Examples of infectious diseases are:

chicken pox	diphtheria (dĭf-thē'rĭ-*a*)
colds	German measles

in'fantile paral'ysis	smallpox
measles	tonsillitis (tŏn-sĭ-lī'tĭs)
mumps	tuberculo'sis
pneumonia (nū-mō'-nĭ-*a*)	ty'phoid fever
scarlet fever	whooping cough

Each disease is caused by its own kind of germ, just as each kind of tree comes from its own kind of seed. Tuberculosis, for example, is always caused by the germs of tuberculosis, and measles by the germs of measles, just as pine trees come from the seeds of other pine trees. There are as many kinds of disease germs as there are infectious diseases.

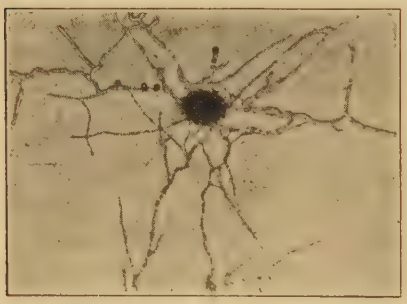
Infectious diseases spread because some of their living germs leave the bodies of the sick and become planted in the bodies of other persons. You will not have an infectious disease unless you take its living germs into your body. One of the principal things that you will study in hygiene is how to keep germs of sickness out of your body. It is therefore important for you to learn what disease germs are, where they are found, how they are spread, and how to keep them out of your body.

Disease and Decay. — An infectious disease in a living body is caused in the same way that decay is caused in a dead thing. A living thing remains sound while it is alive, but after it dies, it undergoes a change called *decay*. A decaying thing becomes soft and falls to pieces, or becomes a liquid. Most forms of decay

are caused by two kinds of living things, called *molds* and *bacte'ria*.

Molds. — Molds are plants which are shaped like the smallest and finest threads or fibers of cotton or silk. Mold on bread or cheese looks like short hair, or fur, but the part that is seen on the outside of the food is only the fruit of mold plants. Many more of the same kind of threads grow through the food itself and cause it to become decayed and spoiled.

The tips of many mold hairs bear knobs which are filled with tiny balls called *spores*. You can sometimes see the spores floating away as dust when you strike a spot of mold. They are like seeds, and when they fall on other pieces of bread or cheese, they may grow into long threads of mold. Many millions of spores are formed in each spot of mold, and so the spores are scattered nearly everywhere.

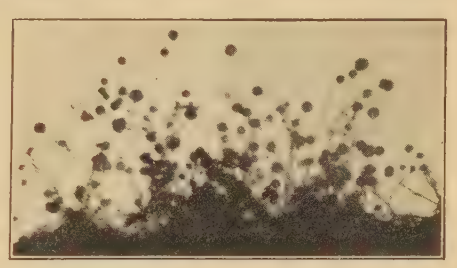


MOLD SPORE AND THREADS

(Magnified 50 times.) The threads are growing from the spore.

Bacteria. — The common forms of decay in which bad odors are produced are caused by tiny plants called *bacteria*, which are the smallest living things that are known. Millions of them could swim in a small drop of water without crowding one another. Powerful microscopes are needed in order to see them at all,

and even then, most bacteria look like small dots and dashes on the page of a printed book. When millions of them grow together in a dish, they may look like a spot of mold.

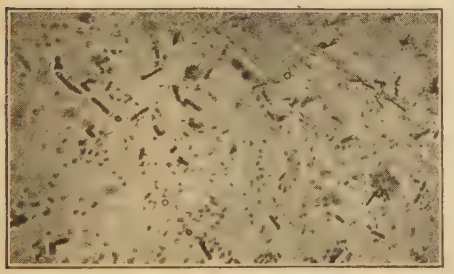


Mold Stalks and Spore Cases

Photograph of the velvety growth of black mold on bread. (Magnified 10 times.)

When a decayed substance becomes dried, the bacteria which may be in it may remain alive and float in the air as dust, and may grow again in a substance upon which they fall. The bacteria of decay, like the spores of mold, are scattered almost everywhere, and are ready to grow in every dead substance which was once alive; and so it is difficult to keep meat, eggs, and other food from decaying.

How Decay Starts. — Decay is catching, just as measles is catching. A substance decays because mold spores or bacteria from some other decaying thing reach it and grow. A decaying apple will cause other apples to become decayed.



Bacteria of Decay

Photograph of two kinds of bacteria growing in decaying meat. (Magnified 1000 times.)

Food that is canned does not decay or spoil because the molds and bacteria in it have been killed by heat and the cans are sealed so that no new spores or bacteria can enter them.

Disease Germs. — Thousands of kinds of molds and bacteria can grow in dead things and cause them to decay. A few kinds can grow in a living body, and these are the disease germs which cause most infectious diseases, such as diphtheria and typhoid fever. Diseases spread because some of their germs leave the bodies of sick persons and enter the bodies of well persons. Catching a disease means taking germs of that disease into the body. Most disease germs are *bacteria*.

How Disease Germs Leave the Body. — The infectious diseases of human beings are spread by means of disease germs which leave the bodies of sick persons. Very few disease germs pass out of the body of a sick person through the skin or with the breath of quiet breathing. They leave the body with the solids and liquids which pass out of the bowel and bladder, and from the nose and mouth of the sick person. If every sick person would guard these four gateways to the inside of the body, and would destroy the substances which escape through them, there would soon be no more infectious diseases, such as typhoid fever, measles, scarlet fever, diphtheria, and tuberculosis. The substances that are blown from the nose and spit from the mouth may contain disease germs which are as dangerous as those which come from the bowel and bladder.

Dirt and Disease Germs. — If a person has an infectious disease, everything which he soils will be likely to contain disease germs. Dirt from his body, from his clothes, and from his room will often be dangerous on account of the disease germs which it may contain. Those who are mildly sick give off living germs of their diseases, and so dirt from any person may be dangerous. One of the greatest reasons for keeping yourself clean is to avoid either taking or spreading disease germs.

There are two kinds of dirt:

1. That which contains disease germs.
2. That which does not contain disease germs.

The kind of dirt which contains disease germs and is likely to make you sick is that which comes from persons. Examples of dirty things which contain disease germs are:

1. Waste water and slops from houses.
2. Soiled towels, handkerchiefs, and underclothes.
3. The dishes from which persons have eaten.
4. Waste substances from bathrooms and toilets.

Examples of dirt which is not likely to contain disease germs or to produce a disease, are:

1. Fresh ashes from a fire.
2. Grease from an automobile.
3. Coal dust.
4. Dust from a haymow.

Disease germs seldom grow outside of a living body, but nearly always are produced in the bodies of persons. They may remain alive for a time outside of the body, and may be found in substances which have come from the body, but they will not be found in dirt or decaying substances unless they are put there after they have grown in the body. If a garbage heap, or dirty water, or impure food causes an infectious disease, the physicians from the Health Department will look for the sick person from whom the disease germs came.

How Disease Germs Enter the Body. — The most common way by which you catch a disease is by taking another person's waste substances into your mouth or nose. A very small quantity of waste substance from the body of a sick person may start a disease, for disease germs are like seeds, and a few in your body may grow to millions in a short time. Some of the common ways of spreading a disease to others are:

1. Sneezing or coughing into the face of another person.
2. Drinking water containing sewage, even in small amounts.
3. Eating food which has been handled by some one with dirty hands.
4. Using a handkerchief, or towel, or dish which has been soiled by another person.

Protection against Infectious Diseases. — You will learn about protecting yourself and others from dis-

ease germs in almost every chapter of hygiene which you study.

The rules of good manners and good housekeeping are also among the best rules of health. If you follow them, you will think of the comfort and health of other persons as well as of your own. You will keep all parts of your body, and your clothes, and your rooms clean; you will see that waste matters from your nose and mouth do not reach other persons; you will always wash your hands after going to the toilet; and you will keep away from other persons when you have a cold, or measles, or other infectious disease.

QUESTIONS

What is the cause of diseases which spread from sick persons to those who are well?

What is meant by an *infectious* disease?

What is the cause of infectious diseases?

What are *molds?*

What is the shape of a mold plant?

How do molds spread from place to place?

What are *bacteria?*

What have bacteria to do with decay?

What are *disease germs?*

Where do disease germs grow?

What are the four principal gateways through which disease germs leave the body of a sick person?

Where are disease germs likely to be found outside of the body?

Name some kinds of dirt which may contain disease germs.

How does cleanliness help to prevent diseases?

How do disease germs find their way into the bodies of well persons?

How may the rules of good manners help to prevent the spread of infectious diseases?

For the Teacher. — Modern discoveries have shown the nature of a cold, sore throat, and other infectious diseases, and how they are spread. An infectious disease is the result of something which is put into the body and planted like a seed. The two conditions which are necessary to produce a disease are:

1. Living disease germs, or seeds.
2. A proper soil in which the disease germs may grow.

Drafts, coldness, dampness, fatigue, and other conditions which were formerly supposed to cause infectious diseases, act by preparing the body to receive disease germs, but no sickness will result from them unless disease germs are planted in the body. This chapter deals with the germs, or seeds, of disease. The following points are to be emphasized:

1. The nature of disease germs and the similarity of disease to the process of decay.
2. The human origin of the germs of human disease.
3. How disease germs leave the body.
4. How the germs enter the bodies of well persons.
5. The kinds of dirt in which disease germs are likely to be found.
6. The value of good manners and good housekeeping in preventing the spread of disease.

CHAPTER III

BATHING

Cleanliness and Good Health. — The principal way by which disease germs may be kept from the body is cleanliness. Many persons seem to think that the only reason for keeping clean is for the sake of good looks. A greater reason for keeping clean is to be well and healthy. You will not take many disease germs into your body if you eat clean food, breathe clean air, drink clean water, and keep everything about your body clean.

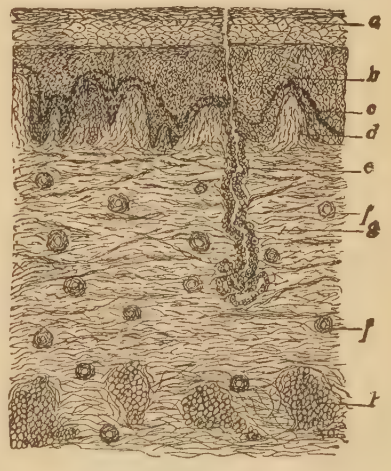


DIAGRAM OF THE SKIN

(Magnified 100 times.) *a*, layer of dead epidermis; *b*, layer of growing epidermis; *c*, layer of epidermis with coloring matter which gives color to the skin; *d*, a ridge of true skin; *e*, a sweat gland extending down into the true skin; *f*, a small blood tube; *g*, fibers of the true skin; *h*, pockets of fat.

The Skin. — The whole body is covered with a skin which is soft and strong. The thickness of the skin may be seen by grasping a fold of flesh on the back of the hand.

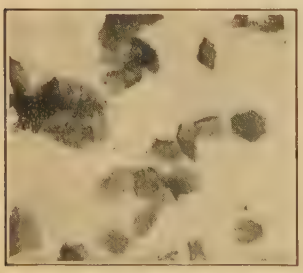
Nearly all of the flesh which can be lifted up is skin.

The skin is made of tough threads of flesh. Leather is an animal's skin that has been preserved by tanning, and its fibers and threads are like those in a person's skin.

The skin is full of blood tubes. The blood in the tubes makes the skin look pink. When any one is faint, the skin is pale and almost white, for then there is only a little blood in it.

Epidermis. — The outside of the skin is covered with fine, soft scales which are matted into a thin sheet. This covering is like a sheet of paper pasted upon the skin. It is called the *epider'mis*. It may be cut and pricked without pain or bleeding. One of its uses is to keep the tender flesh under it from being hurt.

The epidermis is waterproof. It keeps the flesh from drying, and keeps liquids from soaking into the flesh. A healthy epidermis also prevents poisons and disease germs from entering the flesh, for very few kinds of substances can pass through it.



Scales of Epidermis
(Magnified 100 times.)

You are always shedding scales of epidermis from the surface of the skin, and new scales are always growing next to the true skin. By

scraping some of the scales from the back of the hand, and examining them with a microscope, you may see how they look.

Oil in the Skin. — The skin is kept soft by means of a kind of oil or fat. The oil is formed within tiny tubes, called *oil glands*, which lie deep in the skin around the hair roots. There are oil glands in the skin wherever there are hairs, but more of the glands may be found among the hair roots on the top of the head than anywhere else on the body.

Perspiration, or Sweat. — If a bare finger is held against a cold windowpane, the glass soon becomes wet. This shows that water passes off from the skin. The water is the *perspiration*, or *sweat*. It is formed in small tubes, called *sweat glands*, which lie deep in the skin on all parts of the body. It passes off through tiny openings which are often called *pores*. Perspiration is always passing off from the skin. Over a quart leaves the skin of a grown person every day, even on a cold day of winter. The perspiration contains some waste matter which has a salty taste.

Waste Matter of the Body. — When the body works, its flesh wears out just as a machine wears out when it runs. In doing its work the body also uses up a great deal of food in the same way that a steam engine uses up coal when it runs. Flesh that has become worn out, and food that has been used up are waste substances. They are of no more use to the body, but are often poisonous, and would make the body sick

if they were not taken away. Some waste matter is dissolved in the water of the perspiration, and is carried outside of the body by the perspiration.

Dirt on the Skin. The skin becomes dirty from three principal causes:

1. Loosened scales of epidermis are always leaving the body. They may be seen on an arm where the clothing has kept them from flying away. Little rolls of the scales may be rubbed from the skin after a hot bath. Each person sheds about a tablespoonful of scales each day.

2. When perspiration dries, the waste matters that were in it are left upon the skin. These substances have a bad odor and cause the greater part of the smell due to a dirty skin.

3. Dust is blown upon the skin, and many kinds of substances stick to it during work and play. The dirt nearly always contains bacteria of decay, and very often it contains also the bacteria of diseases.

When the skin is dirty, the most dangerous things on it are disease germs. The germs are likely to be carried into the flesh when the skin is cut or pricked. There they may grow and produce pimples, boils, running sores, and blood poisoning. Some of the disease germs in the dirt may also be carried from the skin to the nose or the mouth, or to food, and in that way they may be the cause of a cold, or typhoid fever, or other infectious disease.

Washing the Hands and Face. — The hands are the parts of the body that are the most likely to become dirty, for they are used in working and in handling dirty things. Dirt on the hands is likely to do more harm than dirt on any other part of the body, for they are used to rub the mouth, nose, and eyes, and to do other things which might carry poisons and disease germs into the body. Your fingers and hands are also used in handling food, and all the dirt and disease germs which they leave in the food are likely to be taken into the body. Keeping your hands clean will help to prevent you from becoming sick.

The face, too, is likely to become dirty, for it is seldom covered. If the face is dirty, the nose and the mouth are both likely to be dirty also. Much sickness is caused by breathing dirt into the nose and mouth. By washing your face you get rid of a great deal of the dirt and disease germs which might reach the inside of your body through the nose and the mouth.

Washing the face and hands once a day is not enough, for they get dirty again within a few hours. Wash them when you get up in the morning, for as much waste matter passes off from the skin during the night as during the day. Wash your face and hands before each meal so that you will not soil your food. Wash them again just before going to bed so that no dirt or disease germs from them may harm you while you are asleep. Wash them after any kind of dirty work or play. Also wash your hands after going to the toilet.

A dirty basin may contain disease germs which have been left on it by a sick person. If a basin is dirty, do not use it but wash in water running from a faucet, or in water poured on your hands.

Use of a Towel. — After washing the skin, dry it with a clean towel. If a number of persons use the same towel, some one who is beginning to be sick is likely to leave disease germs on it. A towel that is dirty, or smells as if it had been used, is not fit for drying the skin. When you travel away from home, carry a clean towel for your own use; or else use paper towels and throw them away after you have used them.

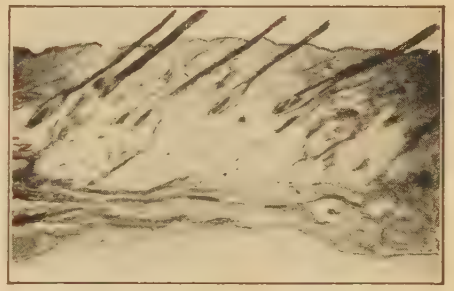
Combing the Hair. — Dirt and disease germs are often caught in the hair of the head, and sickness may be due to failure to keep the hair clean. Germs of colds and sore throats are often blown upon the hair from dirty streets and soiled floors. These germs may be rubbed from the hair upon a pillow during sleep, and then they may be breathed into the body, and thus be the cause of a cold or a sore throat.

You remove a great deal of dirt and dust from the hair when you comb and brush it; and you keep dirt from catching among the hairs when you make them lie smooth and straight. By combing your hair you improve your health as well as your looks.

A dirty comb and brush may carry disease germs into the hair. Have your own comb and brush, and wash them whenever they become soiled. When you go away from home, take them with you so that

you will not need to use those which have been used by another person.

Washing the Hair. — Hairs do not grow from the top of the skin, but from roots which lie deep in the skin. Baldness is due to a disease of the roots and is often caused by disease germs growing in the skin. Sometimes the skin of the scalp peels off in fine flakes called *dandruff*. This, too, is often caused by disease germs. Washing the hair often helps to remove disease germs, and to keep it in good condition.



HAIR ROOTS IN THE SKIN

The roots extend halfway or more through the skin.

Nails. — The nails on the fingers and toes are hardened growths of the outer covering of the skin. Keep them trimmed even with the end of the flesh. Biting the nails will leave them rough and make the ends of the fingers sore.

Many persons suppose that the finger nails may poison the body if they scratch their skin with them, or swallow a bit of nail. The nails themselves are not poisonous, but the dirt that collects under their ends often contains decaying matter and disease germs. Keep your nails clean for the sake of your health as well as of your looks.

A hangnail is not a nail at all, but is a sliver of torn skin that hangs near the nail. Biting or pulling it off makes the skin sore. You can cure it by cutting it off close to the skin.

Washing the Body. — The parts of the body that are covered with clothing do not get dirty so quickly as the hands and face; and yet if these parts are not washed often, dried perspiration will give the skin an unpleasant odor. This odor is a sure sign that the body needs washing all over. You will need to wash your whole body at least once a week, even in winter, if you would prevent its odor from becoming unpleasant.

An Easy Way to Bathe the Body. — In taking a bath you will need some water, some soap, and a towel. Water that is warm, will soften dirt more readily than water that is cold. If you bathe in a warm room, you will be able to take plenty of time for the bath; but if you wash quickly in a cold room, you will feel bright and refreshed because of the cold. A bathroom with running water makes bathing easy; but even if you have no bathroom, you can easily keep yourself clean.

Here is a way to take a bath quickly. Use a basin of warm soap suds. Rub the suds over the whole body and then dry the skin with a towel. In this way you can bathe and dry the whole body within five minutes.

Use of Soap. — The oil on the skin holds dust and dirt fast to it. Water will not mix with the oil, and

so you cannot easily cleanse the skin by washing it with water alone. Soap rubbed upon the skin will make the oil mix with the water, and in this way it will help to loosen the dirt. Use a kind of soap which does not bite or sting the tongue when you taste a bit of it.

WASHING THE HANDS

Wash your hands before you eat or handle food, in order to prevent sickness. Soap will help to loosen the dirt.

Bathing for Stimulation. — A cool bath will make a healthy person feel strong and active. In the morning it is a good plan to wet the whole body and dry it quickly by rubbing it with a towel. This causes a great deal of blood to flow through the skin and makes a person feel wide-awake and ready for work. A basin of water and a towel are all that are needed for such a bath. But a person who is weak or sickly may be harmed by a cold bath, for it may cool his body too much.

If you are tired at night, a warm bath just before bedtime will help to quiet you for sleep. The best time to take a cold bath is in the morning, for it will rouse you up and make you ready for work.

Swimming. — Swimming is a good form of bath if you do not stay in cold water too long. When you first plunge into the water, you may feel cold, but if you stir around briskly, your skin will soon become red and warm, and you will feel bright and strong. If you stay in the cool water too long, the blood will leave the skin and you will feel cold and tired. The time to leave the water is as soon as you begin to feel chilly.

Bathing the Sick. — When a person is sick, a bath will often make him feel better than almost anything else that can be done for him. You can easily give a bath to a person sick in bed by washing one part of his body at a time, and drying it at once. Begin with the face, then wash an arm, and then wash the other arm, then the legs, then the front of the body, and then the back. Cleanse the teeth and mouth also. A feverish person will be helped by having such a bath two or three times a day.

QUESTIONS

In what respect is the skin like leather?
What is the *epidermis?*
Of what use is the epidermis?
Where is perspiration formed?
What substances are dissolved in the water of the perspiration?
Of what does the dirt on the skin consist?
What things compose the most dangerous part of dirt?
Give some reasons why the face and hands should be kept clean.
Give some reasons for using paper towels.
Why should the hair be wa[illegible]

In what way may combing and brushing the hair help to prevent sickness?

How may dirty nails cause poor health?

How may a hangnail be cured?

What causes the unpleasant odor of an unwashed skin?

Of what use is soap in bathing?

In what way may bathing be good for the health even when the body is clean?

Of what use is a cold bath besides cleansing the body?

Of what use is a hot bath?

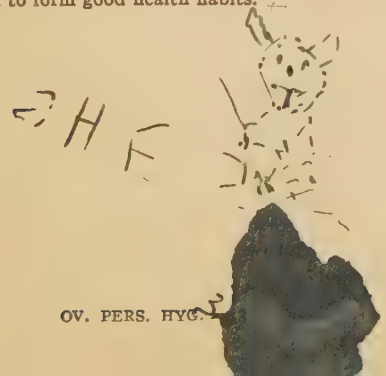
Describe a good way of bathing a sick person.

For the Teacher. — This chapter gives sound hygienic reasons for performing the common daily acts of cleansing the skin, such as washing the hands and face, combing the hair, and cleaning the nails. One reason for cleansing the skin is to remove waste matter, but a more urgent reason is to remove disease germs. The following points are to be emphasized:

1. The necessity of washing the hands before handling food.
2. The danger from the common towel and the need of individual towels.
3. The danger from a dirty basin.

Example is the best teacher. What facilities for washing the hands and face are provided in your school?

Write to the National Tuberculosis Association, 370 Seventh Avenue, New York, for information regarding the Modern Health Crusade. This is a system in which the younger pupils earn credits for regularly doing "Health Chores," such as washing the face and hands, brushing the teeth, and eating properly. The system is founded on ancient knighthood. Pupils enroll as pages and as they progress they earn the titles of squire and knight. The Health Crusade has a strong appeal to the interest and pride of the pupils, to lead them to form good health habits.



CHAPTER IV

CLEANING HOUSE

Dirt and Dust. — A room must be clean, light, and dry in order to be healthful. Dirt is always forming in houses. It falls from shoes and clothing, and drops from packages of goods, and from wood and coal. Bits of wool and cotton are rubbed from clothing and carpets, and shreds of wood are torn from floors. Finger marks are left on doors and windows, and dirt is made during work and play. Some of the dirt floats away as dust in every breath of air and falls in a shower when the air becomes quiet.

Disease Germs in Dirt. — Dirt in houses nearly always contains waste matter from the body, such as scales of dead skin, and substances which are coughed from the throat or blown from the nose. These substances often contain disease germs when an unhealthy person is in the house. They become dried and may float in the air as dust. If there are disease germs in the dirt of the room, they will rise with the dust, for they are even smaller and lighter than the bits of dust which we can see in a sunbeam. A sore throat, tuberculosis, and diphtheria are examples of diseases which may be caught from the dust of dirty rooms. A dirty

or dusty house is unhealthful and dangerous. Cleaning a room helps to make it healthful as well as attractive. The rooms of a dirty house have an unpleasant odor which flies like. Few flies will come into a house in which there are no bad odors.

Sweeping. — One way to remove dirt from a room is to sweep it out with a broom. A living room and a kitchen will need sweeping at least once every day. While you sweep, keep the outside doors and windows open so that the dust will float out of the room. Dampening the floor will keep dust from rising when you sweep. Be careful to sweep in the corners of the room and behind the furniture, for dust and dirt are harmful in those places just as they are in the middle of the room.

Dusting. — Sweeping will remove the larger bits of dirt and dust, but it will stir up the finer dust and spread it through the air. When the air becomes still, the dust will settle slowly back to the floor and the furniture. The cleaning will not be finished until the dust has been wiped from the furniture.

A dry cloth used to dust the furniture will not catch and hold the dust, but will only stir it up and make it float off to another part of the room. Dampen the cloth with a little water or a little oil or kerosene so that it will hold the dust which is wiped up.

To wipe up the fine dust from the floor, use a dust mop.

Cushions and couch covers hold a great deal of dust. Clean them also when you sweep a room.

Cleaning Carpets. — Sweeping rugs and carpets with a broom will take away the dirt which lies on the surface, but it will not remove the dirt which sifts into their threads or goes through them to the floor.

CLEANING RUGS

Rugs may be taken up from the floor and cleaned out of doors where the dust will be blown away.

You can make carpets look clean by sweeping them while they lie on the floor; but the best way to clean them thoroughly is to take them out of doors, and there beat the dirt and dust from them. Rugs are more healthful than carpets, for the rugs can be taken up and cleaned the more easily. A vacuum cleaner is much better than a broom, for it sucks the dirt into a bag and keeps it from flying through the room.

Closed Rooms. – Some persons think that a clean room will not become dirty if it is kept closed. But dusty air blows through cracks in the windows, doors, and floors. After a room has been closed for a day or two, the air in it will smell musty and peppery. A large part of these smells is due to molds. A room that has been closed for a few days will not be fit for use until it has been well aired and dusted.

Sunlight. — Sunlight is a great help in getting rid of molds and disease germs in a house, for it destroys them in the same way that it burns the skin when it shines strongly upon the face. If a room is flooded with light, few disease germs can live in it. Light will kill the germs even though the sun does not shine directly into a room.

Every time that you clean a room, put the mats out of doors in the sunlight. Raise the shades so as to let in the light, and leave them up for some hours. The light may fade the carpets, but it will make the room a healthful place to live in.

A bedroom needs light all through the day, for it is in use longer than almost any other room in the house. When you get up in the morning, leave the shades up and a window open, in order to let light and air into the bedroom. Spread out the sheets and bedclothes so that the air and sunlight will dry the perspiration from them and kill the bacteria in the dirt with which they may be soiled.

Dryness. — If a room is damp, molds grow in it, and disease germs which may be in it are likely to stay alive. Sunlight will help to dry a room.

QUESTIONS

Of what is house dirt composed?
What substances in dirt are dangerous to health?
How should a room be swept?
How should a room be dusted?
Why is a dry cloth not a good thing to use in dusting furniture?

Why should a carpet be cleaned?

Why are rugs on the floors more healthful than carpets that cover the whole floor?

How should cushions be cleaned?

What harm is done by leaving a room closed for days at a time?

How does sunlight in rooms help to make them healthful?

What care should be given to a bedroom in the morning?

For the Teacher. — The principal hygienic reason for keeping living rooms clean is to keep them free from disease germs. Wherever persons gather together indoors, there disease germs are likely to accumulate, unless the rooms are cleaned daily. A great danger is that from dust floating in the air. A test for cleanliness is the amount of dust in the air.

Teach the pupils that they can help to keep a room clean by trying not to bring dirt into it. Demonstrate the correct method of sweeping a room and dusting the furniture. Make the school an example in cleanliness and tidiness.

CHAPTER V

CLOTHES

How Clothes Warm the Body. — One of the uses of clothing is to keep the body warm. Clothes do not make heat, but the body warms itself by making its own heat. Clothing keeps the body warm only because it keeps heat from leaving the body.

Of What Clothes Are Made. — Most clothes are made of cotton, or linen, or wool, or silk. Cotton

SILK MAKERS

Silkworms, their cocoons, and full-grown silkworm moths. Silk is unwound from the cocoons.

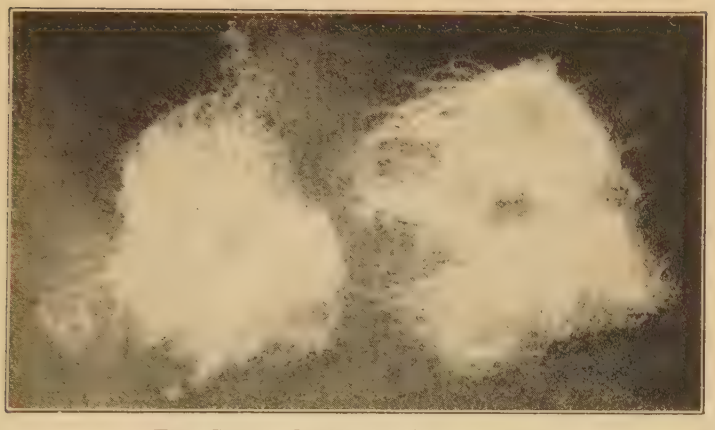
consists of short fibers which grow upon the seeds of cotton plants; linen is the stringy fibers in the stalks of flax plants; wool is the hair of sheep; and silk is composed of fine threads which are unwound from the cocoons of silkworms.

Shearing Wool from a Sheep

Wool and Cotton. — When cloth is loosely woven and soft, a great deal of air is held among its threads. This air is a great help in preventing heat from leaving the body. Fur is warm because of the air which it holds. The threads of woolen cloth usually remain soft and fluffy, even after they are washed, and so wool makes warm clothing.

Cotton cloth becomes hard and matted after it has been wet or washed, and so clothing made from it is not so warm as that made from wool. Linen clothing is about as warm as that made from cotton.

Paper Clothing. — Clothing made from paper weighs but little, and yet it will keep the body as warm as cotton clothing. A newspaper spread under your coat may be used to keep your body warm when you have forgotten your overcoat. A few newspapers spread under the quilts of your bed may keep you warm when you cannot get enough bedclothes.



TWO COTTON SEEDS AND COTTON FIBERS

(Natural size.) The cotton fibers which are spun into threads grow upon cotton seeds.

How Much to Wear. — Your feelings will be your best guide as to how much clothing to wear. Wear enough clothes to keep yourself warm. More clothes than this will be in the way, and will hinder you in moving the arms and legs. In winter you will need a thick suit of underclothes, a warm coat or waist, and an overcoat to put on when you go out of doors on cold days.

Neck Wraps. — If cold air is never allowed to touch the neck, the throat will become tender and will easily be harmed by a slight chill. Use underclothes which reach up to the neck, and wear a low collar on your waist or shirt. When you go out of doors on a very cold day, button your coat up to the neck, or turn up the collar. If you care for your neck in this way, you

will be warmer and healthier than if you bundle it up in thick wraps.

Loose Clothing. — Loose clothes keep the body much warmer than tight clothes, for when they are loose they hold a great deal of air among the layers of cloth (p. 40). For the same reason two thin garments are warmer than a single one which weighs as much as the two.

Damp Clothes. — Wet clothes are likely to be harmful because the vapor passing off from them takes heat from the skin and cools the body. The cooling may injure the body so much that it cannot overcome disease germs if they should enter it. For this reason the wearing of damp clothing may help to bring on a cold or sore throat. But wet clothes are not likely to be harmful if a person keeps warm by exercising. When your clothes become wet, keep moving around and exercising until they are dry or until you can change them for dry ones.

A Rainy Day

The boy is well dressed for rainy weather.

Brushing Clothes. — Clothes which are dusty and dirty often have disease germs on them. Brushing

your clothes and keeping them clean will help your health as well as your good looks.

Brush your clothes every morning as regularly as you wash your face and hands. If you brush them in your room, the dust and disease germs will float in the air, and you will be likely to breathe them into your body. Brush them by an open window or out of doors.

Underclothes. — Underclothes soon become dirty and have an unpleasant odor like that of a dirty skin. Change your underclothes for clean ones at least once a week. If you perspire a great deal, or do dirty work, change them as often as they become soiled.

Many persons think that the only use of underclothes is to keep the body warm, and that there is no need to wear them in summer. An important use of underclothing is to keep perspiration and other waste substances from soiling the outside clothes. Wear underclothes all through the year, in summer as well as in winter.

Washing Clothes. — Sheets, pillowcases, tablecloths, napkins, towels, and handkerchiefs, all become soiled from touching the body. They will nearly always contain disease germs after they have been used by any one who has an infectious disease. But when they are clean and white, they are not likely to have any germs of disease on them. The reasons for washing underclothes and household linen are to make them clean and white, and also to remove or kill the disease germs which may be on them.

Use of Soap. — A great deal of the dirt on clothes consists of oily substances which water alone will not dissolve. Soap in the wash water will help to dissolve the oil, and then the dirt may easily be rubbed or rinsed from the clothes (p. 30). In the place of soap some persons use soda, but soda may soften the fibers of the cloth and weaken the clothes. Use soap rather than soda.

Boiling Clothes. — Boiling clothes is a great help in cleansing them from dirt. The steam bubbling through the threads loosens the dirt, and the hot water dissolves the stains from the clothes and helps to make them white. The boiling also drives off the smell which is in dirty clothes. But one of the greatest reasons for boiling clothes is that the heat kills the disease germs which may be in them.

Ironing. — Ironing clothes after they have been washed helps to keep them clean. The ironing makes them so smooth that they have no folds or creases to catch dust and dirt. It makes the surface of starched cloth so hard and polished that dirt will fall from the cloth instead of sticking to it. The heat of the ironing also kills the disease germs which may be on the cloth.

QUESTIONS

1. How do clothes keep the body warm?
2. How can you know how much clothing to wear?
3. Why is woolen clothing usually warmer than cotton clothing?
4. Why are loose clothes warmer than tight clothes?

How may damp clothes be harmful to health?

Give some reasons why clothes should be kept clean.

Why should clothes not be brushed in a room?

Give some uses of underclothing.

Give some reasons why soiled underclothes should be washed.

Of what use is soap in washing clothes?

Why should clothes be boiled when they are washed?

How does ironing clothes increase their healthfulness?

For the Teacher. — In teaching the subject of clothes, the principal point to be emphasized is the cleanliness of clothes. Teach the need of underwear for cleanliness. Explain the effects of various acts in laundering in removing and destroying disease germs.

The great principle to be taught as to the amount and distribution of clothing is that the sensation of the wearer is a reliable guide.

CHAPTER VI

THE FEET

The Feet and Health. — The feet are put to harder work than any other part of the body, for they bear the whole weight of the body for hours at a time. They are more likely to be injured than other parts of the body, for they are often in places which are cold, wet, or dangerous. If anything is the matter with them, all the rest of the body will suffer also. Many persons suffer tortures whenever they stand or walk, because they did not learn to care for their feet while they were young. The care of the feet is of great importance in preserving the health of the rest of the body.

Fitting Shoes to the Feet. — Soreness, pains, and weakness of the feet are often caused by shoes which do not fit the feet. A well-fitting shoe will be shaped like the foot.

Feet in Their Natural Shape

The inner edges of the feet are naturally almost straight.

Straight Inner Edge of a Shoe. — If the feet are placed side by side, they will touch each other from their toes to their heels, for their inner edges are almost straight. If a shoe is shaped to fit a foot properly, its inner edge must be almost straight.

Shoes with straight inner edges can now be bought at most shoe stores.

While a person is standing, his foot is longer and wider than while he is sitting, for the weight of the

X-Ray Photograph of a Bare Foot That Has a Natural Shape

X-Ray Photograph of a Foot in a Shoe with a Straight Inner Edge

body flattens the arch. A shoe is not large enough unless it is as broad and long as the foot is while it is bearing the weight of the body.

Pointed Shoes. — The longest part of a foot is its inner edge from the heel to the tip of the great toe. If a shoe fits the foot perfectly, its tip will not be

opposite the middle of the foot, but opposite the great toe. A shoe may be made pointed if its inner edge is straight, and its tip is placed at the end of the inner edge. This is because the outer edge of a foot is much shorter than its inner edge. A shoe which fits the right foot will not fit the left foot.

PROPER SHAPE AND WRONG SHAPE OF SHOES

The shoes on the left allow the toes to lie naturally. They have straight inner edges. The shoes on the right cramp the toes together, for the point of the shoe is opposite the middle of the foot.

Ingrowing Toenails. — If the point of a shoe is not opposite the great toe, the curved inner edge of the shoe may press the great toe sidewise and make its edge lie upon the second toe. The pressure will then push the flesh up against the sharp edge of the nail of the great toe, and will produce a painful sore, called an *ingrowing toenail*.

You may prevent or cure an ingrowing toenail by wearing a wide shoe which has a straight inner edge. This shoe will allow the great toe room to lie apart from the second toe, and there will be no pressure to push the flesh against the nail.

Trimming the Toenails. — If the sides or corners of a toenail are trimmed, the nail may not be wide enough to cover the end of the toe. The flesh may then be pressed against the side of the nail. Cut the outer end

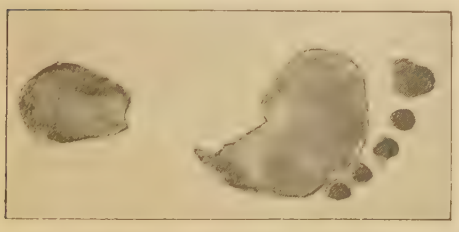
of the nail squarely across and even with the tip of the toe. Do not cut off the corners or sides of the nail, but let them grow beyond the toe so that they will cover and protect the flesh.

Corns. — If badly-fitting shoes are worn, the epidermis grows thick at the places which are pressed or rubbed. These spots of thickened skin are called *corns*. They are tender and painful, for the shoes press them into the flesh. If you always wear well-fitting shoes, you will not have corns.

TOES SQUEEZED TOGETHER

These toes have been cramped out of shape by narrow shoes which did not have straight inner edges.

Arch of the Foot. — If you wet the bare sole of your foot and step upon a piece of dark-colored blotting paper, a print will be left in the exact shape of the parts of the sole which touch the paper. The print will show



PRINT OF A WELL-SHAPED FOOT

The print shows that the middle part of the foot does not touch the floor when a person stands.

that the foot rests upon the heel and the ball behind the toes. The middle of the inner edge of the sole does not touch the paper, and you can put your finger under it. The foot is in the shape of a bow, or arch, which supports the body as springs support an automobile. The arch lessens the jolts and jars caused by running and jumping.

Weak Ankles and Flat Feet. — Many persons have weak ankles, and when they walk, they turn their feet sidewise at their ankles. The arch of the foot is held firm and upright by the muscles of the lower leg, just as a tent pole is held firm and upright by the guy ropes of the tent. If the muscles are weak, the foot turns partly over and is painful during walking or standing. If the foot turns over so far that the top of the arch touches the ground, the person is flat-footed, and is partly crippled. A print of the sole of a flat foot shows that the sole touches the ground along its whole length.

You can strengthen the ankles and prevent flat feet by exercising the muscles of the lower leg. One of the best exercises is to walk with the toes pointing in as far as possible five minutes each day.

Cold Feet. — The feet are kept warm by the warm blood which flows through them. Tight shoes hinder the flow of the blood and make the feet cold. Shoes and stockings which are thin and loose allow the warm blood to flow freely, and are warmer than those which are thick and tight.

Perspiring Feet. — If the feet become wet with perspiration, they may feel as cold as though they were wet with rain. A good way to keep the feet dry and warm is to wear thick inner soles in the shoes. The soles will soak up the perspiration as fast as it is formed. Take the soles out each night and dry them.

Rubber Overshoes. — Rubber overshoes are water-tight and will keep dampness from reaching your feet when you walk in wet places. But they also keep perspiration from passing off from the feet. If you wear them in a warm room, your feet will soon become wet with perspiration, and will feel cold when you go out of doors. Put on your overshoes when you go out of doors in the wet, but take them off as soon as you go into the house.

QUESTIONS

What parts of a foot usually touch the floor when one walks or stands?
What is the shape of the inner edge of a shoe which fits well?
Opposite which toe should the point of a shoe be placed?
What is the cause of an ingrowing toenail?
How may ingrowing toenails be prevented?
In what shape should a toenail be trimmed?
What is a corn?
How may corns be prevented?
Describe the arch of the foot.
What is the cause of weak ankles?
Describe an exercise which will strengthen the ankles and prevent flat feet.
How may tight shoes cause cold feet?
How may perspiration cause cold feet?
How do inner soles worn in the shoes help to keep the feet warm?
Why is it harmful to wear rubber overshoes in a warm room?

For the Teacher. — There are two practical subjects to be taught in the study of the feet:

1. Fitting shoes.
2. Exercises for correcting weak ankles and flat feet.

Three points to be considered in choosing a well-fitting shoe are:

1. Its inner edge shall be straight.
2. The point of the shoe shall be on one side,— on the side of the great toe.
3. The shoe shall be as broad as the foot of the person while standing.

Inspect the shoes of the pupils, and see how they conform to these standards.

The prevention and treatment of corns, callosities, and ingrowing nails consist principally in wearing shoes that are shaped like the foot.

Have several pupils stand barefooted on a table, and examine their ankles and feet. Try to put a forefinger under the inner edge of the foot. The arch will be high in some feet, and almost flat in others.

While a boy is standing naturally, grasp his ankle and try to turn it sidewise. A normal ankle is firm, but a weak ankle is loose and may be turned easily; those who have weak ankles are likely to have low or flat arches. About one fifth of all children have weak ankles.

Demonstrate the corrective exercise of walking "pigeon-toed," — that is, with the toes turned inward as far as possible. Notice how firm an ankle is while the toes are turned in. This exercise lifts up the inner edge of the foot, and produces a pain in the muscles upon the outer part of the shins, showing that those muscles are being exercised.

Examining the ankles and supervising the corrective exercises are among the duties of the physical trainer of a school.

CHAPTER VII

THE NOSE AND THE MOUTH

The Nose. — The nose has two hollow tubes through which air passes into the body. Thin curtains or folds of bone and flesh hang down in the tubes to warm and purify the air of the breath.

Mucus. — The inside of the nose and throat is moist with a slippery liquid which looks like the white of an egg, and is called *mucus*. This is the substance which comes from the nose when it is blown, and from the throat during a cough.

Mucus is somewhat sticky. It catches dust and disease germs which are breathed into the nose, and prevents them from going deep into the body. When you have a cold or sore throat, a great deal of mucus will be found in your nose and throat. This mucus will contain germs of the sickness.

Use of a Handkerchief. — The natural way to cleanse the nose is to blow the mucus from it. This will also remove dirt and disease germs from the nose. When you blow your nose, always use a handkerchief in order to catch the disease germs and keep them from spreading to other persons.

Do not use a handkerchief after it has become dirty, for you might take germs from it back into your body

and so cause a slight cold to become a bad one. Do not use a handkerchief which another person has used, for you might catch a cold from him, or give him a cold when you return it. When you wash the handkerchiefs, boil them in order to destroy the disease germs which may be on them.

CLEANSING THE NOSE

The proper way to cleanse the nose is to blow it upon a handkerchief.

Spitting. — Grippe, tonsillitis, whooping cough, diphtheria, and tuberculosis are some of the diseases which are caused by living germs. In all these forms of sickness the disease germs are given off with the mucus from the nose and throat. If the mucus is spit upon the floor or pavement, it may become dried and blown away as dust, and yet the disease germs may remain alive and cause the disease in any one who breathes in the dust. The germs of tuberculosis may nearly always be found in the dust which blows from a city street, for careless persons who have tuberculosis often go about spitting on pavements and streets.

Spitting on a floor or pavement is dangerous to health. In many cities there are signs which forbid spitting in public places. Spitting is largely a habit. It is seldom necessary for any one to spit in a public place.

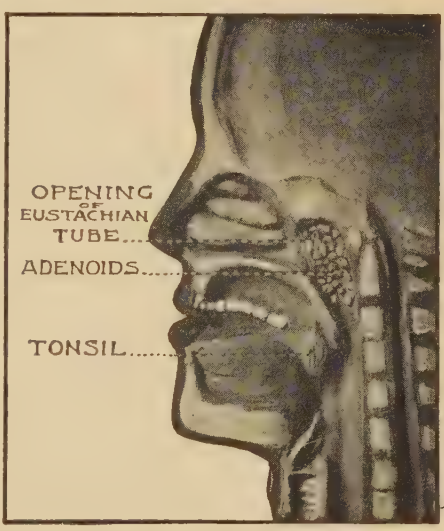
Remove the mucus from your nose and throat before you go among people. Leave the mucus in the gutter or on the ground where there are no people.

A Stopped-up Nose. — When you cannot breathe through your nose, you feel dull and uncomfortable. You cannot do your best work when your nose is stopped up. If you have to breathe through your mouth, find out what is the matter with your nose, and have it cured.

There are three common causes of a stopped-up nose.

1. The nose may be full of mucus. This can be cleared out by blowing the nose.

2. The nose may be stopped up because the folds of its lining are swollen and puffed up with blood. Blowing the nose hard will make the swelling worse, for it will force a great deal of blood into the nose. If you cannot clear your nose by blowing it lightly, you will do harm by blowing it hard.



THE NOSE AND THROAT

Photograph of a model showing how the inside of the nose, throat, and mouth would look if the head were opened in halves.

3. The nose may be stopped up with lumps of soft flesh, called *adenoids* (ăd′ĕ-noidz), growing just behind it.

Adenoids. — Adenoids are folds and tufts of soft flesh growing in the upper part of the throat behind the nose. They partly close the openings of the nose, and are a great hindrance to breathing. Most children who breathe through the mouth do so because they have adenoids.

Enlarged Tonsils. — Breathing may also be hindered by lumps of flesh called *enlarged tonsils*. If the tonsils are enlarged, they will look like two red marbles, one on each side of the throat, half hidden in the flesh just above the back end of the tongue. A person who has enlarged tonsils usually has adenoids also. Adenoids and enlarged tonsils cause a great deal of poor health and sickness. Disease germs grow in them and produce tonsillitis, rheumatism, and heart disease. Children who have them usually snore and sleep poorly because the openings of their noses are small. They have to breathe with their mouths open, their noses and upper jaws become narrow and pointed, and their upper lips seem too short for their

ENLARGED TONSILS

Healthy tonsils are thin and flat, and can hardly be seen.

teeth. They are often uncomfortable with stopped-up noses, and they cannot put their minds upon their lessons. They are often weak and sickly without seeming to have a cause for their weakness.

If you have to breathe through your mouth for the greater part of the time, go to a doctor and find out if you have adenoids or large tonsils. If you have them, let the doctor operate on you and remove them.

A Coated Tongue. — The surface of the tongue is somewhat like the surface of velvet cloth. This furry covering catches and holds many of the things that are in the mouth. Among the substances which may usually be found on the tongue are dust which has been breathed in, mucus like that in the nose, dead scales from the skin which lines the mouth, bacteria of decay, and disease germs. These substances often form a thick white or yellow coating on the tongue when a person is in poor health, or is sick. The coating itself may cause sickness.

Bad Breath. — Many kinds of bacteria may always be found in the mouth. If the mouth is dirty, it swarms with bacteria that produce a kind of decay, and unpleasant odors in the breath. Cleansing the mouth two or three times a day will lessen the odors, and help to remove the bacteria.

Disease Germs in the Mouth. — Disease germs may enter the mouth with impure air, or with impure food, or with dirty substances which are put into the mouth. They may grow and multiply in the mouth

and may spread through the body and cause sickness. Cleansing the mouth will help to protect the body from disease germs.

How to Cleanse the Mouth. — The way to cleanse the mouth is to wash it with water. Rinsing the mouth and gargling will not remove all the dirt, for the mucus is somewhat sticky and holds the dirt fast to the skin until it is rubbed off. When you wash your face, rub the tongue, the inside of the cheeks, and the top of the mouth with a finger, or a clean cloth, or, best of all, with a toothbrush. By doing this you will loosen the coating that is on the tongue, and remove the dirt and decaying substances from the whole inside of the mouth.

Care of the Mouth in Sickness. — In most forms of sickness there is an uncomfortable taste of dryness and stickiness which is caused by the coating on the tongue. Cleansing the mouth and teeth several times a day will remove the unpleasant taste. When you take care of a sick person, cleanse his mouth every time that you wash his face and hands.

Putting Things into the Mouth. — The germs of colds, sore throats, tuberculosis, and most other infectious diseases are found in the mouths and noses of those who have these forms of sickness. The germs may stick to anything which is put into the sick person's mouth. If he wets his fingers with his tongue in order to turn a leaf, he may leave the germs on his book. If he touches the point of his pencil to his tongue

when he writes, he may leave some germs on the pencil. In these and similar ways germs of disease are often scattered where they may reach other persons.

If you touch your tongue with a pencil point every few seconds while you are writing, break yourself of the habit. If you use a pencil or pen which an unhealthy person has touched to his mouth, you may catch a disease from him. Have your own pencils and pens, and when you are not using them, keep them in your desk away from those of other children.

AN UNHEALTHFUL ACT

A pencil touched to the mouth may carry disease germs.

QUESTIONS

What becomes of dust which is breathed into the nose?
What is mucus? Of what use is it?
How may the nose be kept clean?
What are some of the causes of a stopped-up nose?
How can you clear the nose when it is stopped up?
What are adenoids?
What are enlarged tonsils?

What harm is done by adenoids and enlarged tonsils?

Give some reasons why you should always carry a handkerchief.

What harm may be done by using a dirty handkerchief?

What harm may come from spitting?

Name some diseases which may be spread by the habit of spitting.

What harm may come from a dirty mouth?

What is a common cause of bad breath?

Of what does the coating on the tongue of an unhealthy person consist?

How may the mouth be cleansed?

When a person is sick, what care should be taken of his mouth?

What harm may come from the habit of putting things into the mouth?

For the Teacher. — Cleanliness of the nose and mouth is as important as that of the face and hands. The following subjects are to be emphasized:

1. Cleansing the mouth by brushing the top of the tongue with a toothbrush.

2. Cleansing the nose by blowing it. The use of a handkerchief. The need of a handkerchief and its cleanliness. Inspect the handkerchiefs of the pupils, and encourage them to have clean ones at least once a day.

3. Disease germs in mucus. Spitting and the disposal of mucus.

4. A stopped-up nose, and mouth breathing. Adenoids and enlarged tonsils, and the harm they do, and their removal. The work of the nurse and the medical inspector in discovering and correcting defects of the throat and nose.

CHAPTER VIII

THE TEETH

Teeth and Good Health. — The teeth have a great deal to do with the health of the body. Those who have poor teeth cannot chew their food well, and so they do not get the strength that they should from the food, and they often suffer from indigestion and headache. Germs of disease may lie in a decayed tooth, or in dirt between the teeth, and from there may spread to the rest of the body. Decayed and dirty teeth are the direct cause of a great deal of sickness.

Shapes of the Teeth. — In each half of a jaw the two front teeth are thin and sharp like chisels, and are used for cutting bites from food. The next tooth is shaped like a blunt pick and is called the eyetooth. The rest of the teeth have large flat tops, and are used for grinding food. They are often called *double teeth*, or *molars*.

Sets of Teeth. — Two sets of teeth grow in the mouth during a lifetime. Those in the first set begin to appear when a child is about six months old, and when he is about two years old he will have a full set. Then there will be ten teeth in each jaw, making twenty in all. Each jaw will contain four front teeth, two eyeteeth, and four double teeth.

UPPER TEETH OF A FIVE-YEAR-OLD CHILD

There are ten teeth on each jaw, which are replaced later by a second set of ten.

UPPER TEETH OF A TEN-YEAR-OLD CHILD

There are twelve teeth on each jaw, most of them permanent. The end teeth are sixth-year molars.

At about the age of six years some of the first teeth become loose and drop out, but a new tooth soon grows in the place of each one that is lost. One by one the first teeth drop out until, at about the age of

UPPER TEETH OF A FIFTEEN-YEAR-OLD CHILD

They number fourteen. The end teeth are the second permanent molars.

UPPER TEETH OF A GROWN PERSON

There are sixteen teeth on each jaw. The end ones are the wisdom teeth. On one side these teeth happen to be crowded and irregular. This is due to lack of care in childhood.

fourteen, all of the first set are gone, and in their places are twenty teeth of the second set. Twelve more double teeth also grow in the back of the mouth, making in all thirty-two teeth in the second set.

Preserving the Teeth. — If a tooth of the first set is lost, another tooth will grow in its place; but if a tooth of the second set is lost, the jaw will not form another tooth in its place. Few persons have full sets of teeth, for most persons allow them to become injured or decayed. Yet all the teeth of the second set may be preserved through a lifetime if proper care is given to them.

Sixth-year Molars. — The first set of teeth contain only two double teeth on each side of a jaw. If there are three double teeth on either side of a jaw, the tooth that is farthest back is the first tooth of the second set. It appears when the child is about six years old, and is called the *sixth-year molar*. If it is lost, another tooth will not grow in its place.

Many persons suppose that the sixth-year molars belong to the first set of teeth, because they appear while a child is young. Many are also careless about preserving those teeth, because they suppose that other teeth will grow in their places if they are lost. These are among the largest and the most useful of all the teeth, and yet they are often lost while a child is only eight or ten years old. The time to begin to care for them and for all the rest of the teeth is before any of them show signs of decay.

Structure of a Tooth. — A tooth is composed principally of a kind of hard bone called *dentine* (děn′tĭn). The dentine is covered with a thin sheet of hard substance called *enam′el*. The inner part of the dentine contains blood tubes and is painful when it is touched.

Decayed Teeth. — If a tooth is injured, bacteria may grow in it and cause the dentine to decay. Enamel which is sound and whole will protect a tooth from bacteria; but it may become cracked by biting upon fruit pits or other hard substances, or it may become softened by substances which are formed in the dirt of the mouth. Then bacteria may reach the dentine and cause it to decay.

A Decayed Tooth

The decayed part extends to a nerve in one root.

Toothache. — Decayed dentine is soft and black. It crumbles and leaves a hole in the tooth. If the hole is deep, the tooth will be tender and painful. The most common cause of toothache is a decayed tooth.

Use of a Toothbrush. — If teeth are kept clean, they are likely to remain sound and firm through a whole lifetime, because cleanliness will protect them from bacteria of decay. In order to clean the teeth, you will need a toothbrush and a little warm water. Brush the teeth on their inner sides as well as on their outer sides. Brush the back ones as well as the front ones. Rub the brush up and down as well as sidewise,

so that the bristles will reach between the teeth and remove the dirt which is wedged there. After you have gone over the teeth, rub the toothbrush over the tongue and roof of the mouth in order to cleanse them as well as the teeth (p. 58).

Brush your teeth every morning when you get up, for much dirt collects on them during the hours of sleep. It is also a good plan to brush them after each meal, so as to remove the bits of food that may be left on them.

BRUSHING THE TEETH

The regular use of a toothbrush promotes both health and good looks.

A dirty toothbrush may contain disease germs and be dangerous to health. After brushing the teeth, rinse the toothbrush well in clean water so as to remove all dirt from it. Then put the brush in a clean, dry place, where it will not become dusty or soiled.

Use of a Tooth Powder. — A hard, brownish substance often collects upon the teeth and prevents small cracks and holes from being seen when they first begin to form. Using a tooth powder on the brush is a great help in rubbing away this substance and in keeping the teeth clean and white.

Some of the sugar in food may remain between the teeth, and there may turn to sour substances which are likely to soften the teeth and so cause them to decay. Eating a great deal of candy may cause bad teeth. A tooth powder made of chalk will destroy these sour substances, and so will help to preserve the teeth.

Use of a Toothpick. — Bits of food may become wedged between the teeth so tightly that they cannot be removed with a toothbrush. There they may decay and cause the teeth to decay also. Remove them with a soft toothpick, or with a waxed thread or dental floss passed between the teeth. Do not use a pin or other hard pick, for fear of breaking the enamel and so starting a spot of decay.

Filling Teeth. — A broken or decayed tooth does not heal like a sore spot on the skin, but sometimes a dentist can repair it. If one of your teeth begins to decay, go to a dentist and have the hollow part cleaned out and filled. Filling the tooth does not hurt if it is done while the hole is small. If a tooth is filled while it is still strong, it may be made to last a lifetime. Go to a dentist once or twice a year to find out if there are any holes in your teeth. Have

each tooth filled as soon as the tiniest hole is seen in it. If you do this, you are not likely to have toothache, or to lose a tooth. The expense and trouble are small if you attend to the holes as soon as they appear.

Filling Children's Teeth. — The back teeth of the first set do not drop out until a child is about twelve or fourteen years old. They may begin to decay while a child is only two or three years old, and then they may give trouble for years with soreness or aching. Have the teeth of the first set cleaned and filled as carefully as those of the second set.

A Pleasant Visit to the Dentist

Go to a dentist and have your teeth cleaned and filled before they become tender and sore.

Disease Germs in Decayed Teeth. — It is almost impossible to keep the holes in decayed teeth clean. If disease germs should enter the mouth, they may lie in the holes in decayed teeth, and may multiply to great numbers. From there they may spread through the body. Two kinds of disease germs which may often be found in decayed teeth are those which

cause tonsillitis and rheumatism. One of the principal reasons for having decayed teeth filled is to prevent disease germs from growing in them.

In many schools doctors and dentists are appointed to examine the teeth of the pupils and to assist the children in the care of their teeth.

Pulling Teeth. — It may be impossible to fill a tooth that is greatly decayed. Such a tooth is dangerous to health, for it may be the hiding place of disease germs. It is best to have it pulled out. But remember that nearly every tooth may be saved if it is filled as soon as it begins to decay.

Uneven Teeth. — If a few of the teeth are out of line with the others, the opposite teeth will not meet, and it will be impossible to chew well. For this reason crooked and irregular teeth may be the cause of weakness and poor health. If your teeth are not in an even row, go to a dentist and have the row straightened.

The Teeth and Adenoids. — The teeth in each jaw are arranged in a half circle. If a child has adenoids, the half circle of the upper jaw will become flattened sidewise, and its front part will be pointed. Then the upper teeth will not meet the lower ones perfectly, and the front upper teeth will extend beyond the lips. If the upper lip is too short to cover the teeth, the cause is nearly always adenoids (p. 56).

If the jaw is deformed by adenoids, it may be shaped properly by a dentist if the adenoids are first removed.

QUESTIONS

How may the teeth affect the health of the body?

How many sets of teeth grow in the mouth during a lifetime?

How many teeth are in the first set? in the second set?

At about what age does a child get the first tooth of the second set?

What is the sixth-year molar?

Describe the structure of a tooth.

What are some causes of decay in teeth?

What is the most common cause of toothache?

How may the use of a toothbrush help to keep the teeth from decaying?

Of what use is tooth powder? a toothpick?

When should the teeth be brushed?

Name two kinds of disease germs which are often found in decayed teeth.

How may a decayed tooth be repaired?

When should a decayed tooth be filled?

Why is it important to have a decayed sixth-year molar filled?

How may the health of the body be harmed by teeth which are set irregularly in the jaws?

What effect do adenoids have on the shape of the upper jaw?

For the Teacher. — One important hygienic reason for the care of the teeth is that of protection against disease germs. A decayed tooth is like a wound or ulcer of the skin, and is an open way through which disease germs may enter the body.

The causes of decay extend back to early infancy while the teeth are forming. Condensed milk and most other artificial baby foods are often deficient in lime and other elements which are needed in forming hard teeth. A child whose first front teeth decay early will nearly always be found to have been fed on condensed milk or other artificial food. A baby that is properly fed forms hard teeth which are likely to remain sound for a lifetime.

The principal means of preserving the teeth are:

1. The frequent and regular use of a toothbrush.
2. Filling tiny holes as soon as they appear in the teeth.

Emphasize the importance of the care of the first set of teeth. Decay in them is as dangerous as decay in the second set.

Explain the necessity of frequent visits to a dentist. Point out the danger to the teeth from biting hard substances and cracking nuts.

CHAPTER IX

ORGANS AND CELLS

Organs. — The machinery of a man's body is composed of many parts, each of which has its own work to do. A part of the body which has a special work to do is called an *organ.* The engine of an automobile might be called an organ. Your hand is an organ with which you grasp and hold objects.

Organs of Voluntary Work. — When a man works or plays, he uses two sets of organs:

1. He produces motions by means of organs called *muscles.*
2. He thinks by means of an organ called the *brain.*

You can direct your muscles and your brain and make them act as you choose; and so they are called organs for *voluntary* work. Nearly every voluntary act which you do is either a motion or a thought. When you build a box, you use your muscles in measuring the boards, cutting them to the proper size, and nailing them together. You also use your brain in thinking about the plan of the box. When you write, you use your hands in forming letters and your brain in thinking about what you write. Nearly every voluntary act is done by means of the muscles and the brain.

Organs which Support Life. — The life of the body is supported by food and air. The body uses its food and air for three purposes:

1. It grows and repairs itself by building lifeless food into living flesh.
2. It warms itself.
3. It produces its own power for driving its machinery.

The principal actions by which food and air support life, and the organs which carry on the actions, are as follows:

1. Digestion, or the preparation of food to enter the blood, is done by five organs, — the *mouth*, the *stomach*, the *intestine* (ĭn-tĕs′tĭn), the *pan′creas*, and the *liver*.
2. Breathing, or taking air into the blood, is done by the *lungs*.
3. Circulation, or carrying food and air through the body, is done by the *heart* and *blood tubes*.
4. Building new flesh is done by every living part of the body.
5. Oxidation, or the joining of food or flesh to air in a slow burning in order to produce heat and power, is done principally by the *muscles*.
6. Excretion, or getting rid of the burned food, is done principally by the *kidneys*, the *skin*, and the *lungs*.
7. Nerve action, or controlling and directing the actions of all the other parts of the body, is done by the *brain*, the *spinal cord*, and the *nerves*.

Good Health. — When the body is in good health, each living action is balanced with all the rest so perfectly that the body looks and acts the same from day to day. Yet the living body is constantly changing, and some of its parts are built entirely new every few days or weeks. A person, for example, is always shedding the outer covering of the skin and forming a new one; and yet the skin does not change its appearance from day to day, for the new part almost exactly replaces the old.

When an organ acts imperfectly, all the other organs suffer and the body is in poor health, or is sick. If, for example, the stomach does not do its work well, the body does not get the proper amount of food and does not grow or repair its worn parts, but becomes thin and weak.

Every person can make the work of the organs hard, or he can do a great deal to help the organs to do their work well. Many persons make themselves sick by putting the wrong foods into their stomachs, or by eating too much food. On the other hand a person can build up his weight and strength by choosing the proper foods and eating them in the proper way. He can help his lungs by breathing fresh air; his heart and muscles by taking exercise; his skin by bathing; and his brain by sleep. The object of the study of physiology and hygiene is to learn about the various organs of the body, and how to care for them and keep them in good order.

Cells. — An organ of the human body is like a machine which is composed of many parts. The smallest parts of which an organ is composed are called *cells*. A watch contains smaller parts than any other common machine, and some of its parts are about as small as the eye can see without a magnifying glass. The cells of the body are so small that a microscope is needed in order to see the largest of them.

LOOKING THROUGH A MICROSCOPE

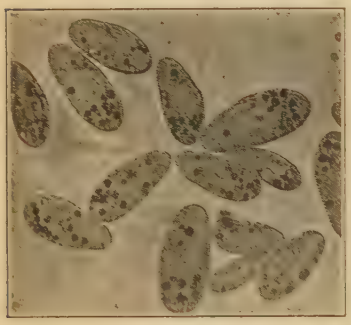
Cells are so small that a microscope is needed in order to see them.

Each organ is composed of cells which have their own shape and arrangement. Scrape some powder from the skin on the back of the hand and examine it with a microscope. You will see thin, flat cells which are like tiny scales. Cells like these cover the whole body, and line the mouth and nose and the tubes which extend into the body.

Muscle cells are like short strings lying side by side. Bone cells are shaped like wheat grains, and are thickly covered with hairs. If a piece of flesh is examined under a microscope, the organ or part of the body from

which it came can be told by the shape and arrangement of its cells.

Every living thing is composed of cells. In the smallest and simplest living things, each animal or plant consists of a single cell. Put a bundle of grass or hay about the size of your thumb into a glass of water and leave it in a warm place for a week or two.



PARAMECIUMS

(Magnified 100 times.) Each paramecium consists of a single cell which eats, breathes, and grows like a cell in a human body.

If you then look at a drop of the water with a microscope, you will see tiny round objects swimming in the water. Each one is an animal which consists of a single cell and is called a *paramecium* (păr-à-mē′shĭ-um), or *slipper animal′cule.* It takes its food and air from the water and gives off its waste matter to the water. When it grows to full size, it divides itself into two parts, each of which is a fully formed animal, like the animal before it divided.

Every living thing begins life as a single cell. A frog's egg is a single large cell which divides again and again until it becomes the countless millions of cells which compose the body of a full-grown frog. The first cells which are formed are round like the egg itself. As the cells multiply, some become flattened and

form the outer covering of the skin; some become stringlike and form the muscles; and others form all the other parts of the frog's body.

Each cell in the body of a frog or a man lives and grows as if it were a separate animal. It lives on food and air which are brought to it by the blood, and it gives off its waste matters to the blood to be carried away. But unlike an independent animal, each cell of a man's body must obey messages brought by a nerve, telling it when the body has need for it to work.

Each organ of the body is like a factory, and each cell is like a workman. The materials which the cells use in their work are food and air. The products which they make are all the different substances which the body forms and all the various kinds of work which it does. When you study the various organs of the body and how they do their work, you learn about their cells.

Living Matter. Cells which are growing or doing work are soft and jellylike, and are composed of three kinds of substances:

1. Water.
2. Protein (prō′tē-ĭn).
3. Minerals.

Protein is the most important part of every living thing. The white of an egg, lean meat, and the sticky part of bread dough are almost pure protein mixed with minerals and water. The minerals are the

substances which are left as ashes when flesh is burned. Two of the principal minerals are lime and salt.

Every living cell carries on two actions:

1. It grows and repairs itself.
2. It does some kind of work.

Cells grow and work by means of the food and air which are taken into the body. Cells take lifeless water, protein, and minerals from food and build them into living flesh.

Oxidation. — When cells do any kind of work, they use up both food and air. They join the oxygen (ŏk′sĭ-jen) of the air to the food by a process, called *oxida′-tion*, which is like a very slow burning in a fire. When the oxygen and wood are joined together, they become smoke and ashes. The oxidation of food and flesh warms the body and produces the power which drives the machinery of the body. The principal way by which the body is worn out during exercise is by the oxidation of its flesh and food.

QUESTIONS

What is an *organ?*

What organs do you use when you do *voluntary* work?

Name some organs which support the life of the body.

What effect does the imperfect action of one organ, such as the stomach, have upon all the rest of the body?

What are *cells?*

Describe a paramecium.

How is a cell of the human body like a paramecium?

Of what three substances is living matter composed?

What becomes of the oxygen which is taken into the body?

For the Teacher. — The concept of the cell is the basis of modern biology and physiology, and is necessary in the study of the working of the inner parts of the body.

Although the subject of cells will not be fully understood by many pupils, yet it should be given for the benefit of those who will pass into the upper grades and pursue the study further.

Show the pupils typical specimens of cells under a microscope. It is nearly always possible to find a physician who will bring his microscope to the school and assist the teacher in demonstrating specimens. The paramecium is a typical one-celled animal that can readily be grown in a glass of hay-water. Typical human cells are those scraped from the skin.

Life is supported by food and air. Make brief mention of the use of air in oxidizing or burning food in order to warm the body and give it strength.

A comparison of oxidation in the body with that in a fire may be made as follows:

Wood + air (oxygen) = smoke + ashes.

Food (or flesh) + oxygen = waste matters (excretions).

CHAPTER X

DIGESTION

Organs of Digestion. — The body builds itself out of bread, milk, meat, potatoes, and other foods. After a food has been eaten, it must become a part of the blood before it can pass into the flesh or be used in doing the work of the body. In order to reach the blood, food is dissolved in some of the fluids of the body and changed to a form which can pass through the sides of the blood tubes and into the blood stream. Changing food to a form which can enter the blood is called *digestion.*

Digestion takes place in a tube which extends from the mouth through the body. The three principal parts of the food tube are the *mouth*, the *stomach*, and the *intestine.* But the digestion of most kinds of food begins outside of the body when the foods are cooked.

Cooking. — Three changes usually take place in food when it is cooked :

1. It is cut up, stirred, mashed, and torn to pieces.
2. It is dissolved in water or in some other liquid.
3. The heat of cooking changes the food to substances which have pleasant tastes and odors, and which may be easily used by the body.

A Cooking Class

Cooking is a useful subject to be taught in a public school.

Mouth Digestion. — The digestive organs continue the softening and dissolving actions which were begun by cooking. The mouth is the first organ which receives the food. It does three things to food:

1. It pours a liquid, called *sali'va*, upon the food.

2. Its teeth grind the food to small bits, and the tongue, lips, and cheeks stir the food about and mix it with saliva until it is a pasty mass. Chewing food well is a long step in the process of digestion, for small bits of food will dissolve much faster than large pieces.

3. The saliva changes some of the food to forms which can enter the blood.

Swallowing. — After a mouthful of food has been chewed, it is rolled into a lump by the tongue and cheeks and is sent backwards into a fleshy tube called

the *esophagus* (ē-sŏf'a-gus), which carries the food down to the stomach.

Stomach Digestion. — The stomach is the second principal part of the food tube. It is a bag holding one or two quarts. It lies in the front part of the body just above the line where the waistband of the clothes is usually worn. It digests food in much the same way as the mouth, as follows:

1. It pours a liquid, called the *gastric juice*, over the food.
2. It stirs and mixes the food, but much more slowly and gently than the mouth.
3. The gastric juice dissolves some of the protein of the food, and changes it to a form which can pass into the blood.

Every few moments the stomach lets a little of the partly dissolved food pass into the third part of the food tube, the *intestine*, or *bowel*. The stomach usually becomes empty in from three to four hours after a meal is eaten.

Intestinal Digestion. — The intestine is a tube a little larger around than the thumb, and about five times as long as the height of the body. It lies in coils which fill the lower part of the body below the level of the waistband. It completes the work of digestion.

The intestine, like the stomach and the mouth, has three actions upon the food:

1. It mixes the food with a liquid which comes from three sources, — the intestine itself, the pancreas (păn′krē-as), and the liver.

2. It stirs and moves the food about.

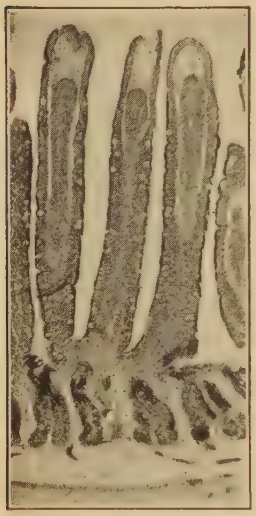
3. The liquids change the food to forms which can enter the blood.

Glands. — The digestive juices seem to come from the inner surface of the digestive organs, like springs of water from the ground. When the tongue is raised, drops of saliva may be seen oozing from two openings just behind the middle front teeth. The saliva and other digestive juices are formed in organs called *glands*.

A gland consists of a tube which extends from the surface into the flesh, and is lined with plump, rounded cells. The cells take material from the blood, manufacture it into a digestive juice, and pour the completed juice into the open center of the tube. A nerve brings messages to the cells, telling them when the body has need for them to form the juices.

The glands which produce the gastric juice and the intestinal juice are short and straight, and are scattered over the inner surface of the stomach and intestine. The glands which produce the saliva and the pancreatic juices consist of long branched tubes which are packed together to form a mass of flesh. The liver is the largest gland in the body. One of its important uses is to form a liquid called the *bile*. The bile flows into the intestine, and there helps to digest food.

How Digested Food Reaches the Blood. — The inside of the intestine is covered with short, velvety threads of flesh called *villi* (vĭl′ī). Blood flows near the surface of each villus and is separated from the food in the intestine by only a thin layer of living cells which cover the villus. The cells do not allow most substances to pass from the intestine into the blood, but they take up digested food, pass it through their bodies, and pour it into the blood stream which flows behind them.



VILLI AND GLANDS BETWEEN THEM

Villi are like tiny roots which take up digested food from the intestine.

The blood carries the food through the whole body and gives it to the parts which need it.

Muscles of the Food Tube. — One of the most important actions of the digestive organs is that of stirring the food about and causing it to pass along down the food tube. The esophagus, stomach, and intestine form a tube and are composed largely of muscles which produce motions in the food tube. When the muscles act, they contract in a ring which runs down the tube and squeezes the food onward, just as you squeeze tooth paste from its tube of tinfoil. The motions are rapid in the esophagus, slower in the stomach, and slowest of all in the intestine. Food

passes through the esophagus in a second or two, through the stomach in three or four hours, and through the intestine in about a day.

Waste Matters in the Intestine. — While the food is passing down the intestine, its digested parts enter the blood. When the food reaches the lower end of the intestine, most of the useful parts have been taken up and only the waste parts are left. These waste substances are of no further use to the body, but are often harmful. The last act of digestion is that of expelling the waste substances from the intestine.

Bacteria grow in the food that lies in the intestine, and produce decay and fermentation, just as they do in food that lies in a warm, moist place outside of the body. When the waste substances lie in the intestine two or three days, they decay and ferment and become poisonous. Expelling the waste matters from the intestine at least once a day is necessary for health.

The muscles which expel the waste matters from the intestine are partly under voluntary control, and may be trained to act at a regular time every day. The time which is usually most natural and convenient is just after breakfast. Going to the toilet every day just after breakfast trains the bowel to empty itself regularly at that hour.

Bulky Food. — The intestine must be partly full in order that its muscles may push the food and waste matters down the food tube. If nearly all the food which is eaten is digested, that which is left will not

be pushed along the food tube, but will lie in the intestine and become decayed and poisonous. One needs to eat some coarse foods, such as celery, turnips, and whole-wheat bread, in order that their unchanged parts may help to fill the intestine and push the waste matters down the food tube.

Taste and Digestion. — The sight, smell, and taste of food that is pleasing cause the saliva to flow into the mouth, even before the food is tasted. They also cause the gastric juice to flow into the stomach, and the muscles of the food tube to act. Foods which look and taste good will be digested far more readily than those which are not pleasing. A pleasing taste and appearance of food not only give pleasure, but also help the body to digest the food.

READY FOR SUPPER

Good table manners help digestion.

Control over Digestion. — You have very little control over your food after you have swallowed it, for you cannot control your stomach and intestine as you can your mouth. But the way in which you eat will have a great effect on the amount of work which your stomach and intestine have to do to food. If, for ex-

ample, the food is not well chewed, the stomach will have to do more than its share of work, and will often have aches and pains while it tries hard to digest the food. If you eat properly, you are not likely to have a single unpleasant feeling to show that your stomach and intestine are at work.

Mealtimes. — The feeling of hunger tells you when your body is in need of food. If you eat as you should, you will be hungry at morning, noon, and night. Three meals a day are enough to satisfy the hunger of grown folks and older children, but small children may need one or two extra lunches.

Eating between Meals. — The stomach needs to rest like any other part of the body. It becomes empty three or four hours after a meal is eaten, and then it needs a rest of at least an hour or two. If you eat between meals, the stomach will get little rest, and will become too tired to do its work well. Eating candy, or fruit, or ice cream between meals is as unhealthful as eating potatoes between meals. The only proper time to eat is at mealtimes.

Fast Eating. — One of the most common faults of eating is that of taking food too fast. If you eat too fast, there will not be time for the saliva to mix with food and do its part of the work of digestion. You will not chew the food well, but will swallow it in lumps which the stomach and intestine cannot easily break up or dissolve. You will also be likely to eat more than you need.

Eat slowly, and take at least fifteen minutes for a meal. Take small bites of food, and chew each mouthful to a paste. Swallow each mouthful before you put another into your mouth. If you eat in this way, your food will digest quickly and readily.

How Much to Eat. — Your feeling of hunger will tell you how much to eat as well as when you need food. Eat until you have satisfied your natural hunger. Then stop eating, and do not keep on eating merely for the sake of the taste of the food.

If you eat all the potatoes, bread and butter, and other plain foods that you wish, and then leave the table, you will feel satisfied and comfortable. But after you have satisfied your hunger with plain food, you may still wish to eat pie, or ice cream, or other dessert, in order to enjoy its taste. Your desire for the dessert will then be a false hunger.

You can usually tell a real hunger from a false one by eating a piece of bread and butter. If you do not enjoy the bread, your hunger is probably false, and you would be harmed by eating a dessert or any other kind of food. But if you really enjoy the bread, you are probably in real need of food, and may safely eat a dessert.

If you wish to eat pie, or ice cream, or other dessert, take it at mealtimes, and eat it only when you are hungry. But if you are really hungry and are in need of food, you will prefer bread and butter to ice cream, or cake, or candy, or other dessert.

Table Manners. — The rules of good table manners are also good rules for eating in a healthful way. If you eat in the way that well-mannered persons do, you will come to the table with clean hands and faces,

A Happy Meal

Food does us the most good when it is taken slowly and with pleasure.

and clean clothes. You will eat slowly and chew your food well. You will sip your drink instead of gulping it down in great swallows. Your food will then digest well, and will make you strong and healthy.

QUESTIONS

What is *digestion?*
Name the organs of digestion.
What effect does *cooking* have upon food?

How does the mouth digest food?

How does the stomach digest food?

How does the intestine digest food?

What is a *gland?*

Describe a gland which produces gastric juice.

Describe a *villus*.

How does digested food reach the blood?

Describe the action of the muscles of the stomach and intestine.

Give some reasons for using some bulky food which does not become digested.

How does the good taste of food help digestion?

How should you eat in order that your food may digest well?

How can you tell how much to eat?

What rules of good table manners are also good rules for health?

For the Teacher. — This chapter is intended to give a broad, simple view of the processes of digestion. An aid in learning the details is to remember that there are three organs of digestion, and that three similar actions take place in each organ.

The three processes of digestion are similar to those which take place in cooking. The stomach and intestine act on food in the same ways as the mouth does.

Dwell briefly on the subject of glands for the benefit of the brighter members of the class (p. 81).

An aid to the teacher is to remember that a person has voluntary control over only the first and the last acts of digestion, — eating, and the expulsion of wastes, — and that if these two acts are properly performed, digestion will go on properly in the stomach and intestine.

The topics of when, how, and how much to eat are important details which may be explained and remembered by reference to the subject of *good manners*.

CHAPTER XI

FOOD

Height and Weight. — A young person who is healthy and properly fed will gain steadily in both height and weight. The following table shows the average height and weight of children at each year of their age:

TABLE OF THE HEIGHTS AND WEIGHTS OF AN AVERAGE HEALTHY AMERICAN CHILD AT EACH BIRTHDAY

	BOYS		GIRLS	
Age Years	Height Inches	Weight Pounds	Height Inches	Weight Pounds
1	29	21	28.5	19.5
2	33.5	26.5	33	25
3	36.5	30.5	36	29.5
4	39	34	38.5	33
5	41.5	38	41	37
6	44	41	43.5	40
7	45.5	49	45.5	47
8	47.5	54	47.5	52
9	49.5	59	49	57
10	51.5	65	51	62
11	53	70	53	68
12	55	77	56	78
13	57	85	58	89
14	60	95	60	98
15	62	107	61	106
16	65	121	61.5	112

A person whose weight and height are as great as those belonging to his age is said to be *well nourished*. If a person is short, but has the proper weight that goes with the height, that person also is well nourished. If a ten-year-old boy is 47.5 inches tall, he has the height of an eight-year-old boy; but if his weight is 54 pounds or more, he is well nourished. He may be short because his parents are short.

WEIGHING AND MEASURING A PUPIL

In many schools the pupils are weighed and measured regularly, and the light-weight pupils are taught what to do in order to grow naturally.

Height and weight are good indicators of a person's health. Lack of weight shows that the body is not making good use of its food. If a body is under weight, the muscles usually lack strength, and the mind cannot do good work. What is called laziness and dullness may be caused by poor nourishment and lack of strength.

When a doctor makes a complete examination of a person, one of the first things which he does is to measure the height and weight. If the weight is too

little, the lightness is usually due to one of three causes:

1. A sickness, or a disease, or a defect.
2. Overwork or lack of rest.
3. Wrong food or improper eating.

Diseases and Defects. — Common forms of disease and defects are enlarged glands, tuberculosis, decayed teeth, adenoids, and tonsils which are large and diseased. These conditions may not give pain or feelings of sickness, and yet may cause a person to be thin and weak. Pain may be a good thing if it drives a person to take treatment for a disease or defect. A thin person who has a serious disease or defect must be cured before natural growth can take place.

Rest and Nourishment. — A person who works too hard, or does not get enough rest, uses up his food before it can be built into flesh. Some of the conditions which keep children thin and poorly nourished are: going to parties often; going to moving pictures at night; and sitting up late. A proper amount of rest is necessary for good nourishment.

Food and Nourishment. — Proper food is always necessary in order that a person may grow naturally, and be well nourished. There are two important things which one must know about food in order to grow naturally and become strong:

1. How to eat (pp. 85 and 86).
2. What to eat.

Classes of Foods. — Any substance which can become a living part of the body or be used in doing its work, is called a *food*.

Foods are divided into two principal classes:

1. *Flesh-forming* foods, or those which can become living flesh.

2. *Fuel* foods, or those which are oxidized in order to warm the body and produce power for doing work (p. 76).

Flesh-forming Foods. — The body builds itself out of the water, minerals, and protein which are in its food (p. 75). Any food which contains them is called a *flesh-forming food*. The body needs some flesh-forming foods every day in order to grow and to repair its worn-out parts.

The principal flesh-forming foods are milk, meat, and foods made from grain. All these foods contain minerals and protein.

Fuel Foods. — The greater part of the food that is eaten is fuel food, and is burned in the body to produce heat and power. There are three principal substances which the body uses as fuel:

1. Fat.
2. Sugar.
3. Starch.

Nearly all the fat that is eaten is soon burned in the body like coal in the boiler of a steam engine. The fat which is in the body is that which cannot be burned at

once, but is stored in pockets of flesh to be used during sickness or at other times when the body cannot take food.

The principal foods that contain fat are meat and milk. Butter is the fat of milk. Fat is also found in a few kinds of vegetable foods, such as nuts, cocoa, and peanuts. But the body cannot use vegetable fat so well as it can animal fat.

Nearly all the sugar that is eaten is quickly burned in the body. Some may be stored in the body for a short time, like fat, but there is very little sugar in the body at any one time.

Starch is very much like sugar and must be changed to sugar before the body can use it.

Either sugar or starch is found in nearly all kinds of grains, vegetables, and fruit. Grains and vegetables contain a great deal of starch.

Vitamins. The body needs a small amount of substances, called *vi'tamins*, which help it to use its other food substances. If a child does not eat food substances containing vitamins, it grows slowly, is thin and weak, and acts as if it were tired and sad. It is necessary that a child eat plenty of foods containing vitamins, in order to grow and be bright and active.

There are two great sources of vitamins:

1. Milk, and foods made from milk, such as butter and cheese.

2. Vegetables and fruits that are eaten raw.

Foods which contain few vitamins are:

1. Cereals made from fine white flour.
2. Lean meat.
3. Potatoes and other vegetables as they are often cooked.

A person who lives on cereals, lean meat, and potatoes alone will be poorly nourished, and weak or sickly, because these foods lack vitamins. But these foods are wholesome and nourishing when milk and salads or raw fruit are eaten with them in order to supply the missing vitamins.

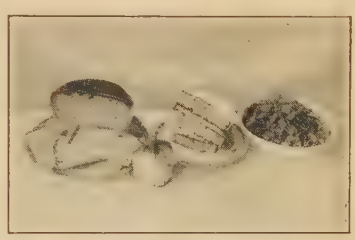
Foods for Bulk. — The body needs some food materials which do not become either flesh or fuel, but which help to fill the food tube and to carry other substances down the tube. Examples of these materials are the coarse, stringy parts of celery and turnips, and the bran in whole-wheat flour (p. 84).

Foods for Taste. — Substances are often added to a food in order to give it a pleasant taste. Examples of substances which are eaten on account of their taste are pepper, mustard, vinegar, spices, and sugar. Flavoring substances are needed because the body does not make good use of its food unless the food has a pleasant taste (p. 84). The chief value of some foods, such as pickles, is in their taste.

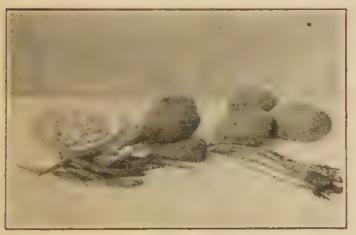
Food Groups. — All the food substances which the body needs are found in four groups of foods, which may be bought in the markets. These groups are as follows:

1. Animal foods, such as milk, eggs, meat, and fish. These supply flesh-forming substances and vitamins.

1. Foods taken from animals



2. Cereals



3. Fleshy vegetables

4. Green vegetables and fruit

THE FOUR FOOD GROUPS

In the course of a day, eat at least one food from each group. Be sure to choose milk every day.

2. Cereals, or foods made from grain, such as bread, oatmeal, corn-meal muffins, and crackers. These supply fuel substances and also flesh-forming material. When they are made from the whole kernels of grain, they supply vitamins.

3. Fleshy vegetables, such as potatoes, peas, beans, and beets. These foods are both fuel and flesh formers. They also contain some vitamins.

4. Leafy vegetables and fruit. These supply bulk, minerals, and vitamins. Examples of leafy vegetables

are lettuce, celery, spinach, and cabbage. Examples of fruit are oranges, apples, tomatoes, and berries.

Remember these four groups of food, for you will need to eat something from each of them every day.

Food Lists. — If you had to get the meals for a family for a day, what foods should you choose? *Choose something from each of the four food groups.* You could skip some of the groups in any one meal, but in the course of the day you should take something from each group.

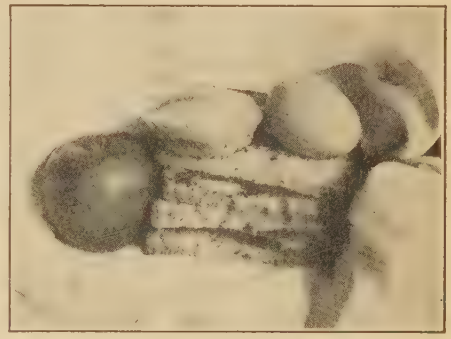
Here is a list of wholesome foods which might be chosen for the meals for one day:

Breakfast	Noon Meal	Supper
Bananas	Bean soup	Beef stew
Oatmeal	Broiled codfish	Bread
Boiled eggs	Mashed potatoes	Butter
Bread rolls	Bread	Sponge cake
Butter	Butter	Lettuce salad
Milk	Custard	Milk
	Milk	

Water, or a drink made mostly of water, should be used with each meal.

The foods on this list are chosen from all the four groups of foods, and they contain all the kinds of food substances which the body needs. They also have a pleasant taste. A person must use them or foods like them every day in order to be strong and healthy.

Lunches Away from Home. — When you take a lunch to your work or on a picnic, choose the foods in the same way that you would for a meal at your home table. Your body would find it hard to make use of a lunch of such things as cake, pickles, candy, and soda water, for these are eaten principally for their taste. A good lunch is one of sandwiches made of simple foods, such as crackers and cheese, or bread and butter with jelly or lettuce. To these you can add a hard-boiled egg, fruit, and plain cake.



A Good Lunch

When you go away from home, take a lunch of plain, wholesome food.

Milk. — Milk is one of the most important of all foods for children, for it contains flesh-forming and fuel substances, and also minerals and vitamins, which promote growth. Growing children need some form of animal food, — either milk, or eggs, or meat, or fish. Milk is the best form of animal food, and it is also the cheapest. If milk is used, very little other animal food is needed. Every child who is undernourished needs a glass of good milk at every meal.

Salads. — Green vegetables and fresh fruits supply nearly the same kinds of vitamins and minerals as

milk; and in addition they are bulky foods which assist the muscles of the intestine in their work (p. 83). Salads made from green vegetables and fruits are tasty foods, and are needed by every person every day.

Lack of a Food Group. — A person who omits the foods from any of the four groups that are given on page 95 will seldom grow naturally, or be strong in body or mind. A common error in choosing food is that of leaving out the foods of one of the groups. Some children do not like vegetables, and others do not like milk. Among the first questions that are asked about a thin, under-nourished child are what foods the child eats, and what it refuses to eat.

Lack of raw, fresh foods of the vegetable and fruit groups for some weeks produces a disease called *scurvy*. This disease was once common among sailors on long voyages while they could not get fresh vegetables; but fresh vegetables or fruit would quickly cure it. A mild form of scurvy often causes pains in young children who eat no fresh vegetables or raw fruit.

Desserts and Sweets. — A common error in the choice of foods is that of eating too much sugar. Candy, ice cream, soda water, and desserts contain a great deal of sugar. A person who eats a great deal of them takes more sugar than the body can use. When these substances are eaten between meals, the stomach is overworked, and the appetite for a meal is spoiled. An under-nourished child will not grow large and strong if sweets are eaten in place of plain nourish-

ing food. Sweets are good foods when they are eaten at mealtimes while a person is hungry; but they are harmful when they are eaten between meals or after a full meal of other foods has been eaten.

QUESTIONS

1. Is your weight what it should be for your height and age?
2. What are the three principal causes of light weight?
3. Give a definition of *food*.
4. Of what uses are foods to the body?
5. Name some flesh-forming foods.
6. Name some fuel foods.
7. What becomes of the protein in foods? of the sugar and starch? of the fats? of the minerals?
8. What are *vitamins?* In what foods are they found?
9. Name the four principal groups of foods.
10. Make a list of foods for a day's meals which will contain all the food substances which the body needs.
11. Make a list of foods for a lunch away from home.
12. What substances in milk make it one of the best of all foods for children?
13. What valuable food substances are in salads?
14. What is scurvy?
15. What harm comes from eating too much of desserts and sweets?

For the Teacher. — Normal growth is the best indication and test of good nutrition. The table of heights and weights is a reliable standard for judging the state of nutrition in the majority of children. The school nurse and the medical examiner are expected to weigh and measure the children, and advise and assist those who are poorly nourished.

The pupils should know and understand the three principal causes of undernourishment, and make a special study of food in relation to growth and vigor.

The brighter children will remember the classification of foods and the elementary food substances, but all pupils should remember the four *food groups*, for every one of the groups must be represented in the daily bill of fare of a well-nourished person. Emphasize the importance of knowing the four food groups by having all pupils write out what they ate for a day. See if each pupil ate something chosen from each group.

CHAPTER XII

CARE OF FOOD

Wholesome Food. — Most common foods are nearly always wholesome while they are fresh, but they often become unwholesome after they have been handled or kept for some time. The two principal causes which make food unwholesome are:

1. Decay.
2. Handling by diseased persons.

Decayed Food. — Most kinds of food are likely to become spoiled, or sour, or decayed, unless they receive proper care. The principal causes of the spoiling and souring are bacteria and molds growing in the food (p. 16). Bacteria and molds produce unpleasant odors and tastes, and may make the food poisonous. Food that has become decayed or sour is unfit for use. One of the great objects in caring for food is to keep it free from molds and bacteria.

There are four principal means of preventing molds and bacteria from growing in food:

1. The heat of cooking.
2. Coldness.
3. Dryness.
4. Cleanliness.

Heating Foods. — Boiling a food kills the molds and bacteria that are in it. If meat, fish, and other foods that easily decay are cooked, they keep fresh longer than those which are raw. One way to keep food wholesome is to cook it soon after it is bought.

Canning Food. — Food is kept fresh in air-tight cans for months and years. In a common way of can-

CANNED FOODS

These foods keep wholesome because the molds and bacteria in them have been killed by heat, and they have been sealed in cans which no new molds and bacteria can enter.

ning, the food is first boiled so that the bacteria and molds in it are killed. It is then placed in cans which have also been boiled, and the cans are sealed air-tight. Vegetables, fruit, and meat which have been properly canned will keep fresh for months and years, because molds and bacteria cannot reach them. But after a can is opened, the food spoils quickly, because molds and bacteria may then enter it.

Coldness. — Most kinds of molds and bacteria grow very slowly when they are kept cold; but they grow rapidly at the temperature of the air on a warm summer day. Coldness is one of the best means of keeping food fresh. You can keep food cold by placing it in an ice box, or in a cellar, or in a spring or well of water. If you have none of these things, you can store the food in the coolest part of the house.

Foods in large markets are kept for weeks or months in refrigerators, or in cold-storage rooms in which the temperature is kept nearly freezing, or even below freezing.

Dryness. — Molds and bacteria cannot grow without water, and so they grow best in places which are damp. In dry places and in foods which are kept dry, they grow very slowly, if at all.

Some kinds of food which decay or spoil quickly will keep fresh and wholesome for a long time if the water in them is taken away. Apples, prunes, and raisin grapes are preserved by drying. Even dried eggs and milk may be bought in the markets, and will remain fresh and wholesome for months if they are stored in a dry place.

Cleanliness. — The molds and bacteria which make food spoil are spread by means of dirt and dust. Clean food keeps fresh for a long time, but dirty food soon spoils. A food and everything which touches it must be kept clean if the food is to remain fresh and wholesome. Cleanliness of the kitchen, dining room, and

pantry is more important than that of any other room in the house; but most important of all is cleanliness of the dishes in which food is put.

Washing Dishes. — Washing dishes is one of the most important things to be done in good housekeeping. Bits of food left in a dish may decay, and bacteria in a dirty dish may produce decay in food which is afterward put into the dish. A dirty dish may contain disease germs which have come from the mouth of a diseased person.

WASHING DISHES

Use plenty of boiling water in order to kill disease germs which may be left on the dishes.

When you wash dishes, you must have the water boiling hot in order to kill the disease germs and the bacteria of decay. Wash the dishes first in a pan of hot soapsuds, and then rinse them in clean boiling water in order to remove the drops of dirty water which cling to them, and to kill the bacteria in them. Be sure to have the dish cloths and the towels clean.

House Flies and Food. — House flies come from filthy places into kitchens and dining rooms, and sprinkle food with dirt and disease germs. A food over which flies have crawled is unwholesome. There are three principal means of keeping flies away from food:

1. Driving them out of the house.
2. Screening the windows and doors and covering the food.
3. Cleanliness.

Flies come into the kitchens and dining rooms because they are hungry and thirsty. They find their food by their sense of smell, and they like that which is decayed or sour. If a kitchen or dining room is kept clean, and the food covered, there will be nothing for flies to eat, and no strong odors of decaying substances to attract them to the room.

Disease Germs in Food. — Persons are sometimes made sick by eating unwholesome food. Sickness caused by food is of two kinds:

1. That caused by food which is decayed or spoiled.
2. That caused by disease germs.

Disease germs can grow in the body, and so they are far more dangerous than the bacteria of decay, which cannot grow in the living flesh of the body. Disease germs come from persons; but they are sometimes found in food because persons who are sick, or diseased,

or dirty handle the food and leave some of their disease germs upon it.

There are two principal means of spreading disease germs to food:

1. Dirty hands which touch the food.
2. Coughing or sneezing over the food.

Food may contain disease germs when it is handled by persons who have a cold, or sore throat, or other disease which is catching. In many hotels and camps, those who handle food are examined so that the sick or diseased workers may be found and kept out of the kitchens and dining rooms. The heat of cooking will kill most disease germs that may get into food. Cooked food is nearly always safer than that which is raw; but cooked food may be made unwholesome if it is handled by a diseased person. If a food is to be eaten raw, wash it well before it is eaten or prepared for the table.

Milk. — Milk that is pure and fresh is one of the best of all foods. Babies must have it in order to grow fast and be healthy, but they are easily made sick by milk which is sour or spoiled.

The milk of a healthy cow is nearly always wholesome when it is first drawn. Its souring and spoiling are caused by bacteria which enter the milk with dirt. The three principal means of keeping milk pure and fresh are:

1. Cleanliness. 2. Cold. 3. Pasteurization.

WHOLESOME MILK IS CLEAN

The cows, the stables, and the milkers must be clean.

Cleanliness of Milk. — If dirt can be seen in the bottom of a pitcher or bottle of milk, that milk will contain many bacteria and will not keep fresh and

WHOLESOME MILK IS KEPT IN CLEAN CONTAINERS

The pails, bottles, and pitchers in which milk is put must be clean.

WHOLESOME MILK IS KEPT COLD

Keep the milk in an ice box or in some other cold place.

sweet, and will not be fit for babies or young children. In order to have pure, fresh milk, there must be cleanliness of the cows and stables, and of the hands of the milkmen; but most of all, the pails, cans, and bottles into which milk is put must be kept clean. Bits of milk left in a pail or bottle will decay and produce unpleasant odors. Cover a milk pail or bottle for a few moments and then uncover it and smell of the inside. If it has an unpleasant odor, milk put into it will have the same odor and taste, because the bacteria of decay which cause the odor will grow through all the milk.

Coldness of Milk. — It is important to keep milk cold in order to prevent bacteria from growing in it. Keep milk in the coldest part of an ice box or other cold place.

Disease Germs and Milk. — A person who has a cold or other infectious disease is likely to leave disease germs in the milk which he handles. The laws of many cities and states do not allow persons who are sick to handle milk.

Pasteurized Milk. — If milk is heated nearly boiling hot, the bacteria and disease germs that may be in it are killed. Preparing milk by heating it to 145° F. for thirty minutes is called *pasteurizing* (pȧs'tẽr-īz-ĭng) it. If milk is cooled quickly after pasteurization and is kept cool, it will keep sweet and wholesome for days. Pasteurized milk is the safest milk on the market.

Milk can easily be pasteurized at home. Place a bottle of milk in a pan of water and heat the water

until it is almost boiling. Let the milk bottle stand in the water for half an hour, and then remove it and cool it quickly. Pasteurized milk is usually the only safe milk for babies.

QUESTIONS

What two principal causes make food unwholesome?
What is the cause of decay in food?
How may molds and bacteria be prevented from growing in food?
How is food *canned?*
Why should food be stored in a cold place?
Why does dryness keep food from spoiling?
Why does cleanliness help to keep food fresh and wholesome?
Give some reasons for washing dishes.
Why should *hot* water be used in washing dishes?
What harm may house flies do to food?
Where do disease germs in unwholesome food usually come from?
How may dirty hands make food unwholesome?
What are the three principal means of keeping milk pure and fresh?
How does cleanliness help to keep milk fresh and wholesome?
How does coldness help to preserve milk?
Why should a person who has a cold not handle milk?
How is milk pasteurized?
Why is pasteurized milk usually a safe milk for babies?

For the Teacher. — All the topics in this chapter are important; but the most important of all is the danger of food being infected by sick persons or carriers who handle the food. Call particular attention to the sickness that may result when food is handled by any person who has what seems to be only a mild cold, or sore throat, or intestinal disturbance. Many epidemics of diphtheria, scarlet fever, and typhoid fever have been caused by food handlers who were only mildly sick.

Other topics to be emphasized are:

1. The value of cleanliness, coldness, and dryness in keeping food fresh.
2. The need of boiling hot water in washing dishes.
3. The danger from house flies on food.
4. The need of cleanliness and coldness in the care of milk.
5. The value of the pasteurization of milk.

CHAPTER XIII

DRINKS

Water as a Food. — Water has two principal uses in the body:

1. It is a food.
2. It carries waste matter away from the body.

The body contains about three times as much water as solid substance. Water is always passing off from the body, and in a day a grown person gives off about three quarts. He must therefore swallow about three quarts of water each day in order to replace that which is lost. Water is the most necessary food that the body takes. The body can live for only a few days without water, but it can go without other food for two or three weeks.

Water and Waste Substances. — The water which leaves the body carries away its waste matters. When food and living flesh are oxidized in the body, they become changed to substances which are like the smoke and ashes of a fire (p. 76). They are then no longer useful, but are waste substances which are carried away by the blood. The substances which are like smoke are carried to the lungs and are given off with the breath. Those which are like ashes are

carried to the skin, kidneys, liver, and intestine, and are given off by those organs (p. 71).

The waste substances that are contained in the perspiration consist largely of minerals, which make it salty.

The kidneys are two glands which lie in the back of the body beside the lowest ribs. Their cells are arranged in long tubes which are folded and coiled to form two masses of red flesh. In a grown person they remove about three pints of water from the body every day. The other three pints which leave the body are given off with the perspiration and the breath.

Amount of Water Needed Daily. — A grown person needs to take about three quarts of water each day in order to wash away the waste matters from the body. If less than this quantity is taken, the skin and kidneys cannot remove the waste matters readily, and the body will be poisoned with its own worn-out substances. But if the proper quantity of water is taken, the skin and kidneys will easily carry the waste matters from the body. About half of the water which the body receives is contained in food, and the other half is taken in the form of plain water or other drinks.

When to Drink. — It is usually safe to drink pure, cool water whenever there is a feeling of thirst. Water can be taken as safely with a meal as at any other time. But a person who is in a hurry sometimes swallows water so as to wash the food down his throat

quickly. This use of water is wrong. If you eat slowly, you may safely drink enough water to satisfy your thirst.

It was formerly thought that persons sick with a fever should not drink water. This was a great mistake. Cold water cools the sick person's body and helps to carry away the poisons of the sickness. A sick person will seldom be harmed by drinking all the water that he wants, if he takes it slowly.

Ice Water. — When water is pleasantly cool, it is more healthful than when it is either hot or very cold. Hot drinks and those which are ice cold are both unhealthful when they are swallowed quickly and in large quantities. If a person is thirsty and drinks quickly, he is likely to swallow three or four glasses of ice water before he is satisfied, because he does not wait for the water to pass into the blood. If a glass of pure, cold water is taken in sips, it is not likely to be harmful at any time.

Coffee and Tea. — Coffee and tea satisfy thirst because they are mostly water. They contain substances which are likely to make a person restless and wakeful, and so they are not proper drinks for children. They drive the body to action, but do not supply it with power or new flesh. A grown person who is compelled to work long hours may be helped sometimes by coffee and tea, but children will be harmed by them or anything else which drives the body to action.

Under-nourished children need rest and nourishing food. Coffee prevents them from resting, and so prevents their bodies from building flesh out of their food. A breakfast of coffee and bread makes a poor beginning for a day's work. A glass of milk or a cup of cocoa made with milk is much better than coffee or tea.

Milk. — Milk is both a food and a drink. Some persons seem to think that milk is a food for babies only, and that for grown persons it is only a drink like tea or coffee. Milk is a valuable food for both grown persons and children. A glass of milk contains as much food as a small helping of beefsteak or a good-sized slice of bread. Milk also contains vitamins which promote growth, and minerals which are needed in order to form sound teeth and firm bone. Every poorly nourished child needs a glass of milk with every meal.

Soda Water. — Plain soda water which is sold from soda-water fountains is water which is bubbling full of carbonic acid gas, and is a harmless and refreshing drink. When the water is flavored with sirups, or ice cream, or fruit juices, it becomes a food like anything else that contains sugar, fat, and other food substances. Taking soda water between meals is as harmful as eating sweets between meals.

Lemonade, ginger ale, and sarsaparilla contain sugar, and when they are taken between meals, they are as harmful as other sweets (p. 98).

in which the stream of water spurts sidewise from a covered opening. A person drinks from the outer end of its stream, and saliva from the drinker's mouth cannot fall upon the opening from which the water flows.

QUESTIONS

In what respect is water a food?
How much water enters and leaves the body each day?
What has water to do with ridding the body of waste matters?
What organs give off water and waste matters from the body?
Of what use is water to a feverish person?
How should ice water be drunk?
Of what use are coffee and tea? Why should children not use them?
In what respect is milk a valuable food as well as a drink?
What substances are in soda water?
Why are public drinking cups harmful?
If you have to drink from a public cup, how should you place your lips to the cup?
Give some reasons for using paper drinking cups.
Describe a form of drinking fountain that is healthful.

For the Teacher. — This chapter deals with the physiological effects of water. Emphasize the need of an abundance of water in the body.

Made drinks consist of water, plus other substances. Show the harmfulness of tea and coffee to children, and the value of milk as a food as well as a drink.

Explain the danger of contamination of public drinking cups and fountains with disease germs from the saliva of the drinker. Explain the kind of fountain which is safe.

What kind of cups or fountains are used in your school?

CHAPTER XIV

PURE WATER

Impurities in Water. — Impure drinking water is likely to cause sickness. Most of the water which is used in houses comes either from underground, or from rivers and lakes. It often contains mud, and bits of sticks and leaves. Most of these substances are harmless to the body, but if the water contains enough of them to give it an unpleasant odor or taste, or to make it muddy or cloudy, it is generally not fit for use.

The most dangerous things that are found in drinking water are not those which can be smelled, or tasted, or seen with the naked eye. Most dangerous of all are the disease germs, which are too small to be seen without a microscope. Dirty water is very likely to have disease germs in it, but water that is clear and sparkling and has a pleasant taste may also contain disease germs, for they may be left in the water after the harmful impurities which can be seen and tasted have been taken out.

Sewage. — The waste water and slops from kitchens, bathrooms, and laundries are called *sewage* (sū′ăj). Sewage often contains disease germs which have come

from sick persons. Most disease germs which reach drinking water come from sewage, or from barnyards. The way to keep drinking water pure is to dispose of all slops and other sewage and barnyard drainings in such a way that they cannot reach the wells, or

An Unsafe and Untidy Way of Getting Rid of Waste Water

The drain pipe from a kitchen sink should be carried to some distance away from the house.

springs, or streams from which drinking water is taken. Failure to do this has been the cause of a great deal of sickness. Typhoid fever has been spread to hundreds of persons in a city by the slops from a single farmhouse on the banks of the stream which supplied the city with water.

Wells. — A well is a shaft or pipe sunk down to the underground water. Old-fashioned wells were large open holes lined with brick or stone. Dirty water from the house or barnyard often ran between the

AN UNSAFE WELL

The water is impure because it contains drainage from the barnyard

joints, and worms and toads dropped through the cracks into the water. These old wells have been the cause of a great deal of sickness. A well is now usually made by driving a small iron pipe into the ground, and screwing a pump to its upper end. Nothing can fall into such a well, and no water can flow into it from the earth above the ground water. The water which is drawn from it will be pure if the underground water is pure.

Public Water Supply. — Wells may safely be used on a farm or in a small village, but the people of a large village or a city must go to a distance to get pure water, for in crowded parts of a town much sewage is thrown upon the ground and reaches the underground water. The supply of pure water is usually taken from a river or lake, and is brought to the houses by means of iron pipes laid underground in the streets. Most cities and large villages have public water supplies.

Streams and Rivers. — The water from a river is usually safe for drinking if no slops or other sewage reaches it from towns along its course, or from persons living on its banks. But many cities and villages have to take their water from streams which contain sewage, and therefore it is often necessary to purify the water before it can be used safely.

Filter. — One way of purifying water is by passing it through a *filter*. A common form of filter is a box filled with sand and small bits of charcoal. The sand and charcoal strain out impurities, and allow the pure water to pass through.

A filter is of little value unless it is very large, and the water runs through it slowly. Small filters, to screw on kitchen faucets, have been manufactured, but they are of little use in taking disease germs from water.

Cities sometimes purify their water by passing it through huge filters of sand.

Boiling Drinking Water. — Boiling impure water will usually make it safe for drinking. The boiling will not remove dirt or take away a bad taste, but the heat will kill the germs of disease that may be in the water. Long boiling spoils the taste of water by driving off the air that is dissolved in it. If the water is taken from the fire as soon as it begins to boil, the disease germs will be killed and yet the taste of the water will not be spoiled.

Where water is impure, persons are sometimes told to drink tea or coffee instead of water. The tea or coffee is safer than water only because it has been boiled.

If you are not sure of the purity of drinking water, drink only that which has been boiled.

Ice. — Ice is sometimes taken or made from water which is not fit to drink, and is used in cooling drinking water and food. If there were disease germs in the water of a river or lake before it was frozen, the germs will be found in the ice, for freezing will not kill them. The ice may also contain disease germs which were left on it by workers or skaters, or by those who sell the ice or handle it. Before you put ice in your water or food, wash it, and be sure that it is as pure as pure drinking water should be.

Purifying Sewage. — Underground water comes from rain which soaks through the soil. It is nearly always pure, because the soil is a great filter and removes impurities from the water which passes down through

it. The water of nearly every driven well, spring, river, and lake is therefore naturally free from disease germs, and would always be free from them if slops and other sewage were kept from it. Taking care of the sewage of a house is usually much easier and safer than purifying water after it has been made impure.

A common way of getting rid of the waste water of a house in the country is to throw it out of doors upon the ground. If only a little dirty water is poured upon the land, it will sink into the soil and become pure by the time it reaches the underground water. The soil, acting as a filter, will strain out and destroy the impurities and disease germs.

It will not do to empty a great deal of dirty water upon a small spot of ground, for soil that is soaking wet cannot purify the water. It will not be safe to allow the water from a kitchen sink to form a dirty puddle upon the ground. Catch the waste water from the kitchen in a pail, and empty it on the back yard, first on one place and then on another. Put only a little at a time on each place. If the ground is frozen, empty the slops on some spot from which they will not run into a well or stream when the ground begins to thaw.

Cesspool. — Emptying slops and other sewage on the ground may be safe on farms and in small country places, but this will not be a safe thing to do if the houses are near together. One way of getting rid

of all kinds of sewage in small towns is to empty the waste water from each house into a large covered hole in the ground called a *cesspool*. The solid parts decay in the cesspool, and the water slowly sinks into the deeper parts of the soil. But it will not be safe to take drinking water from a well that is near the cesspool.

If a layer of rock or clay is just beneath a cesspool or other dumping place for slops or other sewage, impure water may flow along it and reach a well some distance away. The place for a cesspool is where both the surface of the ground and also the underground rock or clay slope away from the well or other place from which drinking water is taken.

THE SEWAGE DISPOSAL PLANT OF A SMALL VILLAGE

If the plant is properly run, it will have no unpleasant odor, and the outflow from it will be harmless.

Sewage Disposal in Cities. — In cities the waste water is usually carried away in underground pipes called *sewers*. Many sewers empty into the nearest river, lake, or other body of water. But this makes the water impure and dangerous for drinking, washing, and

bathing. The people of the city of Albany, N. Y., have to spend large sums of money in purifying their water, because the Hudson River, from which the city water is taken, contains the sewage of the city of Troy, which is about ten miles above Albany. A better way to get rid of sewage is to purify it in sewage disposal works at public expense.

QUESTIONS

What are some of the common impurities in drinking water?

What are the most dangerous impurities in impure water?

What is sewage?

What harmful substances are found in sewage?

How do disease germs usually reach drinking water?

Why is water from a driven well usually more healthful than water from an old-fashioned open well?

What is a filter?

How does a filter purify water?

Why does boiling impure water make it safe to drink?

How may ice which is used for cooling drinking water be the cause of disease?

What purifies slops and other sewage when they are thrown upon the land?

What is a good way to dispose of the dirty water that flows from a kitchen sink?

What is a cesspool?

Why is it unhealthful for city sewers to empty into a river, lake, or other body of water?

Give some reasons why the people of a city should purify their sewage.

For the Teacher. — This chapter deals with pure water and sewage disposal. The principal sources of dangerous impurities in drinking water are sewage and outdoor toilets.

In judging the purity of the water of a well or other source of supply, one should inspect it for three conditions:

1. Is there any barnyard drainage, cesspool, toilet, or other dumping place for waste water near it?

2. If the source is a well, is it covered or protected so that waste water or other harmful substances cannot fall into it?

3. Does the water look clear, and does it have a pleasant smell and taste?

Emphasize the necessity of boiling drinking water if one is not sure of its purity.

LAMP CHIMNEY FILTER

Muddy water is made clear in passing through the soil in the filter.

Show how the soil acts as a filter and purifies dirty water which falls upon it. Place a lamp chimney upright in a pan, fill it three quarters full of garden soil, and pour muddy water into it until it is full. The water which runs from the chimney into the pan will be clear.

The five common ways of getting rid of waste water from a household are:

1. Throwing it upon the ground near the house.
2. Collecting it in a pail or barrel which is emptied away from the house.
3. Leading it away from the house in a long pipe, and changing the location of the outer end from time to time.
4. Emptying it into a cesspool.
5. Taking it away in a sewer.

Explain the need of care in each of these methods.

What are the toilet arrangements at your school? Is its receptacle fly-tight? Is the toilet clean? Is it a model one for the community?

An unclean, overflowing, tumble-down school toilet will give the pupils the impression that rules of hygiene are theoretical and are not to be applied in their town. If the toilet of your school is not a model one, make a complaint to the health officer of your district.

CHAPTER XV

STIMULANTS AND NARCOTICS

What a Stimulant Is. — When we wish a horse to travel fast and far, we may give it plenty of oats and hay so that it will have strength to do its work; or we may beat it with a whip, and so compel the animal to use all its strength in a single journey. An old Roman name for a whip was *stim'ulus*, and so the name *stimulant* is given to anything which acts like a whip to the body.

One Kind of Stimulant
The old Romans called a whip a *stimulus*.

Coffee and tea are mild stimulants, for they act like whips. They may help to keep a person awake, and rouse the body to action, but they are not foods; therefore they add nothing to the strength of the body. A person who uses them to drive himself to action will wear out his body and make himself weak.

Narcotics. — There is a class of substances, called *narcot'ics*, which soothe the body, ease pain, and produce sleep. They produce pleasant feelings because they dull the mind and prevent it from having unpleasant feelings. A person who takes a narcotic is like one in a dream, when impossible things seem

real and foolish acts seem proper. A person who is bright and strong in mind controls his thoughts and acts, and does not allow himself to do foolish things. But the mind of one who takes a narcotic acts like a car running down hill with no brakes to stop it.

Many stimulants are also narcotics, and give false feelings of strength, brightness, and happiness because they dull the brain so that the mind does not feel keenly or think clearly. If a stimulant takes away a tired feeling, a person thinks he is strong and fresh. If it takes away his pain, he feels as if he were well and sound. If it makes him forget a trouble or worry, he acts as if he were happy.

Drug Habits. — Stimulants and narcotics belong to a class of substances called *drugs*, which are poisons to the body, and may easily cause death. Although a drug may cause pleasant feelings for a time, yet the person who takes it will feel its harmful effects after the drug has left the body. The person will then want more of the drug to soothe the unpleasant feelings produced by the first dose. Drugs do not satisfy a person. The more one takes, the more one wants, and soon a person forms a habit of using a drug and becomes a slave to it. The drug also dulls the mind. He who uses it has no strength to stop its use even when he knows that it is doing him great harm.

Excuses for Using Drugs. — One excuse for using drugs is to stop pain. They ease pain because they

dull the mind to the painful feeling. Pain is a useful feeling, for it is a sign that the body is sick or injured, and it drives a person to seek a cure. But a drug does not remove the cause of the pain. It only hides the pain, and leaves the person in as much danger as ever.

Another excuse for taking a drug is to produce sleep. But the sleep produced by a drug is not natural, and the person who takes the drug feels worse upon waking.

A physician is the only person who can give a drug safely, and when he has given it, he still watches the sick person in order to remove the cause of the sickness.

Alcoholic Drinks. Alcohol is a liquid which is often used as a stimulant and narcotic. It is seldom taken pure, for it has a peppery, burning taste; but it is mixed with water and flavors in such drinks as wine, beer, and whisky. Drinks which contain alcohol are often called *strong* drinks, while those which contain no alcohol are called *soft* drinks. All strong drinks are stimulants and narcotics, and are harmful to the body.

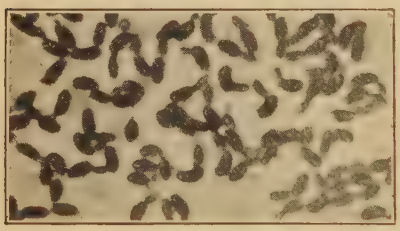
The first kind of strong drink which men used was made by squeezing the juice from grapes or other fruit and letting it stand until it was partly spoiled. By the change called *fermenta'tion*, some of the sugar of the fruit juice was changed to alcohol.

Fresh grape juice is a food. When it is first made, it is as wholesome and as harmless as the grapes

themselves; but after it has stood for a few days, unless it is properly canned, it ferments and its sugar becomes alcohol. The juice is then no longer a food, but a harmful stimulant and narcotic. This fermented juice is called *wine*.

Another form of strong drink is *beer*, which is made from hops and grain which has sprouted. It contains alcohol and is harmful to the body, like other alcoholic drinks.

Yeast. — The change of sugar to alcohol is made by microscopic plants called *yeast*. These plants may live after they are dried, and they often float in the air as dust. Fruit juice or other mixture containing sugar can seldom stand for many hours without having yeast plants fall into it from the air. The yeast plants grow and change the sugar to alcohol and a gas. The gas bubbles up and makes the liquid appear as if it were boiling.



YEAST PLANTS

(Magnified 1000 times.) The plants need sugar. As they grow, they change the sugar to alcohol and a gas.

Yeast in Bread. — Yeast is used in making bread. A yeast cake consists of dried yeast plants, mixed with flour or meal. Bread dough is a mixture of flour, water, and yeast. The yeast plants grow rapidly, and in a few hours they produce a large quantity of

gas which puffs up the dough until it is full of holes like a sponge. When the dough is baked, it becomes so firm that the gas holes keep their shape. A good loaf of bread is full of holes, and sounds hollow when it is tapped with the fingers.

The yeast plants in a lump of dough also form alcohol, but all the alcohol is driven away by the heat of baking.

Most yeast cakes contain many bacteria, but these usually grow more slowly than the yeast. If the bread dough is either too warm or too cold, the yeast may grow slowly, and the bacteria may grow rapidly and produce sour substances. The bread will then be sour.

Vinegar. — Fruit juice often becomes sour after it has stood for some days. The souring is caused by bacteria which grow in the juice with yeast plants. The bacteria change the alcohol of the juice to a sour substance, and the liquid is then called *vinegar*. The word vinegar comes from two French words, meaning sour wine. Vinegar is used as a flavoring for foods, such as pickles and salad dressings.

Alcohol. — Alcohol is a liquid which looks like water. It is formed in any fermenting mixture of water and sugar, and may be separated from the greater part of the water by a process called *distilla'tion*. This consists of boiling the mixture, collecting the steam, and cooling it to a liquid.

Alcohol will dissolve many things which water will

not dissolve, and so it is largely used in manufacturing. It will burn with a hot flame, without smoke or soot, and so is often burned in lamps and stoves. It may be used in engines in place of gasoline. It will keep decaying things from rotting, and is largely used to preserve substances. Alcohol has valuable uses, but it is put to a wrong use when it is taken in strong drink.

Danger from Strong Drink. — Any drink containing alcohol is a dangerous stimulant and narcotic. It injures the stomach, the liver, the lungs, the muscles, and all the other organs of the body. Worst of all, it injures the brain and dulls the mind. Those who drink it are made thoughtless and unkind, and are led to do things of which they are ashamed when the alcohol has left the body. It causes men to commit crimes, and ruins them in both mind and body. It does so much harm that the Constitution and laws of the United States of America forbid the manufacture and sale of strong drink, such as beer, wine, and whisky.

Opium. — Other narcotics that are often used are *o'pium* and *morphine* (môr'fĭn). Opium is the dried juice of opium plants. Morphine is a much more powerful substance that is manufactured from opium. The two drugs are used for easing pain and producing sleep. They are valuable drugs when they are given by a skilled physician, but when they are wrongly used, they are dangerous poisons, and injure both the body and the mind. Men often form habits of their use,

and so their sale is forbidden by law, except on the order of a physician.

The Tobacco Plant. — Tobacco is a plant whose stalk grows straight up almost as tall as a man. Its leaves are as large as the leaves of an ordinary book. It bears white or pink flowers which are about the size and shape of a very small drinking goblet. It is a beautiful plant and is sometimes grown in flower gardens for ornament.

TOBACCO PLANTS
There are many varieties of tobacco plants. Some grow higher than a tall man.

Thousands of acres of land in our country are now planted with tobacco, and millions of pounds are raised each year. Nearly all of the crop is used either for smoking, or for chewing, or as snuff.

History of Tobacco. — The people of olden times did not chew, or smoke, or take snuff, for they had no tobacco until the early discoverers found it in America, and learned its use from the Indians. Then men began to imitate the Indians, and soon the whole world learned the tobacco habit. After Virginia was

settled, the principal crop which the colonists raised was tobacco, and the plant was valued so highly that its leaves were used as money.

Use of Tobacco. — Farmers and florists use tobacco in killing insects on plants and animals, for it contains a poisonous substance called *nicotine* (nĭk′ō-tĭn). Tobacco was once used as a medicine, but men long ago found out that it was too poisonous to be given to sick persons.

Effects of Tobacco. — A person does not usually like tobacco when he first tries to use it, for three or four whiffs of smoke contain enough nicotine to make him feel sick. If he keeps on trying to smoke, he may become somewhat used to the nicotine, and can then smoke a cigar or a pipeful of tobacco without feeling sick. But some persons cannot learn to take tobacco at all without feeling sick, and all smokers and chewers have to be careful not to take too much tobacco at one time.

Many persons think that nicotine is not poisoning them if they do not feel sick while they are smoking or chewing. But it has other poisonous effects besides making a person feel sick. It may poison the heart without giving any bad feelings at all. Very few persons are able to use a great deal of tobacco without showing some of its poisonous effects.

The Tobacco Habit. — Those who have learned to use tobacco without feeling sick often learn to like it, and then they want it so badly that they do not stop

using it even when they begin to feel its harm. Thus men form a habit of its use, and many have difficulty in breaking themselves of the habit when they feel its harm.

Spitting. — A small chew of tobacco, or a cigarette contains enough nicotine to make a grown person dangerously sick if he should swallow it. But those who chew and smoke do not swallow much of their saliva. The spitting which goes with chewing and smoking is one of the bad things about the use of tobacco, for unhealthy smokers and chewers often spread diseases by spitting on floors and sidewalks (p. 54). Smoking and chewing are the cause of most of the spitting which is done in public places, and so the use of tobacco is often the cause of spreading diseases. Thus one who uses tobacco may endanger others as well as himself.

Tobacco and Boys. — Tobacco is a far worse poison to growing boys than it is to grown men. Boys sometimes think that they can safely smoke the small rolls of tobacco called *cigarettes*, which contain only a small amount of nicotine. But the poison that is in a cigarette will harm a boy more than the poison of a pipeful of tobacco will harm a grown man. After a man is grown up, his muscles and heart and all the rest of his body cannot be easily changed, for they are fully formed and strong, like a great oak tree. But a boy's muscles and heart are growing, and may be harmed as easily as a tender young oak.

Tobacco and Growth. — If a boy does not grow, there is something the matter with him. In many schools and colleges the students are measured and weighed each year, and the boys who use tobacco are nearly always found to be shorter, lighter, and more slender than those who do not use tobacco. A boy may think he looks like a grown-up man while he is smoking, but any use of tobacco will hinder his growing up to be a strong man.

Tobacco and Strength. — Most boys' schools have athletic teams which play games and run races with the boys from other schools. The boys on the teams have to train so as to be strong and healthy. If they wish to have the best chance of winning, they will not do anything which will lessen their strength. One thing which the boys must let alone is tobacco, for few smokers ever win. A boy cannot smoke and be a good athlete.

Tobacco and the Mind. — The teachers of public schools keep a record of every pupil's work. In Chicago and in some other cities, the records of those who smoked have been examined and compared with the records of the rest of the pupils. Not one smoker in twenty was found to be up with the rest of the class, and hardly any boy who smoked was near the head of his class. A boy cannot smoke and have a bright mind. Men who hire boys to work for them try to employ those who do not smoke or use tobacco in in any other form.

QUESTIONS

1. What did the ancient Romans mean by the word *stimulus?*
2. Name some common things which are used as stimulants.
3. What is a *narcotic?*
4. What is a *drug?*
5. What excuses are often made for using narcotics and other drugs?
6. What harmful substance is in *strong* drink?
7. What is fermentation?
8. What harmful substance is usually formed by fermentation?
9. What is *yeast?*
10. How is yeast used in making bread?
11. What are some of the dangerous effects of strong drink?
12. What is opium? morphine?
13. What harmful substance is in tobacco?
14. What are some of the harmful effects of tobacco?
15. How does the use of tobacco tend to spread diseases?
16. Why is a cigarette more harmful to a boy than a pipeful of tobacco to a grown man?
17. What effects have tobacco on growth? on strength? on the mind?

For the Teacher – There is great need that the accepted scientific facts about stimulants and narcotics should be taught. In this chapter alcohol and tobacco are classed as poisonous drugs, and their effects are set forth in a simple form, and in outline only.

Explain the relation of yeast plants to fermentation and to the production of alcohol; also explain that alcohol is produced during the fermentation of home-made wines and beers. Refer to Chapter II and explain that yeast plants grow and act like molds and bacteria.

Explain that tobacco is especially harmful to persons who are young and growing.

CHAPTER XVI

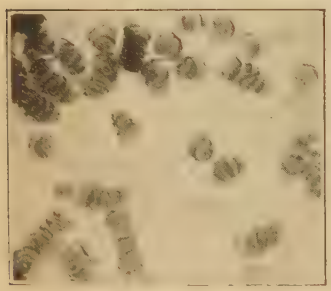
BLOOD

The Use of Blood. — Every part of the body must have both food and air in order to remain alive. These substances are supplied to the flesh and bones by the blood. If any part, such as a finger, should fail to get blood, it would die within a few hours.

Blood consists of three parts:

1. A liquid.
2. Red cells.
3. White cells.

The liquid part of the blood is called *se'rum*. It looks like yellowish water, and contains digested food which has been taken up from the intestine by the villi (p. 82). One of its uses is to become food for those parts of the body which are in need of repair.



RED BLOOD CELLS

(Magnified 500 times.) As seen through a microscope, the cells usually lie upon one another like coins piled up.

Red Blood Cells. — A great many tiny round bodies float in the liquid of the blood. Most of these bodies are

red, and so they make the blood appear red. These red bodies are called *red cor'puscles*, or *red blood cells*. Their use is to take up oxygen from the air which is breathed, and to carry it through the body for use in oxidation.

White Blood Cells. — A few of the bodies which float in the blood are whitish or colorless, and are called *white corpuscles*, or *white blood cells*. One of their uses is to destroy disease germs which may be in the blood and flesh. Every day some disease germs are breathed into the body with dusty air, some are swallowed with food, and a few are rubbed into cuts and scratches on the skin. But most of the germs fail to grow, because the white blood cells seize them and kill them as soon as they enter the flesh.

WHERE THE HEART, LUNGS, AND STOMACH ARE

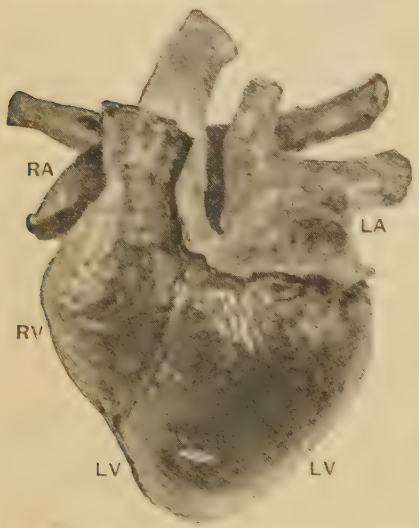
H, heart; *L*, lungs; *S*, stomach. Notice how high they lie in the body.

The Heart. — While the body is alive, the blood is always kept flowing through all its parts by a pump called the *heart*.

A person's heart is about the size of his fist. It lies in the front part of the body behind the breastbone. If a hand is placed over the left side of the chest, the lower end of the heart can be felt beating at every stroke which it makes.

The heart is a double pump. Its right side pumps blood through the lungs only, but its left side pumps blood through all the rest of the body.

Each side of the heart consists of two parts. The upper part has thin walls and is called an *au'ricle*. The lower part is called a *ven'tricle*, and has walls which are thick and strong. The ventricle does most of the work of pumping the blood.



HEART OF A THREE-MONTHS OLD LAMB (Natural size) *RA*, right auricle; *RV*, right ventricle; *LA*, left auricle; *LV*, left ventricle

Heartbeats. — The heart of a man beats about seventy-five times a minute, but a child's heart beats a hundred or more times a minute. When a person runs fast or does other hard work with the muscles, the heart beats hard and fast in order to supply the working parts with all the food and oxygen that they need.

If a person runs hard until he is ready to drop, his heart may keep on beating hard after he stops running. In this way boys who train for long races sometimes injure their hearts for life. It is a good thing to practice running and lifting, but if a person

puts forth all his strength for more than a few minutes in a day, he may harm his heart.

During a fever or other sickness the heart usually beats faster than it does in health. If it beats twice as fast, the sickness is dangerous, for the heart may soon wear itself out by its rapid work. If you should become very sick, lie still in bed so as to give your heart as little work to do as possible, for every motion will add to its work.

Arteries. The heart sends the blood to every part of the body by means of tubes called *ar'teries*. Each beat of the heart causes a wave to shoot along the arteries. This wave is called the *pulse*. The pulse can be felt wherever a large artery runs near the skin. It may easily be felt on the thumb side of the front of the wrist. When a doctor visits a sick person, he feels of the pulse of the wrist and counts its beats to see how fast and how hard the heart is beating.

FEELING THE PULSE
The pulse may be felt on the thumb side of the front of the wrist.

Arteries can change their size in order to carry the amount of blood that each part of the body needs. They are wrapped with muscles which can shorten themselves and make the blood tubes small. When

the muscles are not acting, the arteries are large and carry a large quantity of blood. On a cold day the arteries of the skin become small in order to keep the blood away from the cold air. But when the body is warm, the arteries become large and the skin becomes red with blood.

Veins. — The part of the blood that is not used by the flesh is brought back to the heart by another set of tubes called *veins.* If you hold your hand down at arm's length for a few minutes, blood will fill the veins under the skin. The veins will then look like bluish, raised lines. If you hold your hand above your head, the blood will flow out of the veins and the lines will disappear.

VEINS IN THE HAND

Veins are larger and much more numerous than arteries.

Capillaries. — Blood goes from the ends of the arteries into the beginnings of the veins by passing through tiny tubes called *cap'illaries.* The capillaries are so small that they cannot be seen without a microscope. They are so close together that they make the skin appear pink. Press the end of a finger upon the back of your hand. After the finger is lifted, the spot that was pressed will appear white, because the blood

will be squeezed from its capillaries. But in a second the blood will return and make the spot pink again.

Substances go back and forth between the blood and the flesh by passing through the sides of the capillaries, as water soaks through a thin sheet of paper. In this way food and air pass from the blood to the flesh, and waste matter goes from the flesh into the blood.

The Circulation. —Blood flows from the heart through the arteries, then through the capillaries, and then through the veins back to the heart. This flow of blood through the body is called the *circula'tion.*

If a drop of blood leaving a finger were to go back to the finger, it would flow to the right side of the heart, then to the lungs,

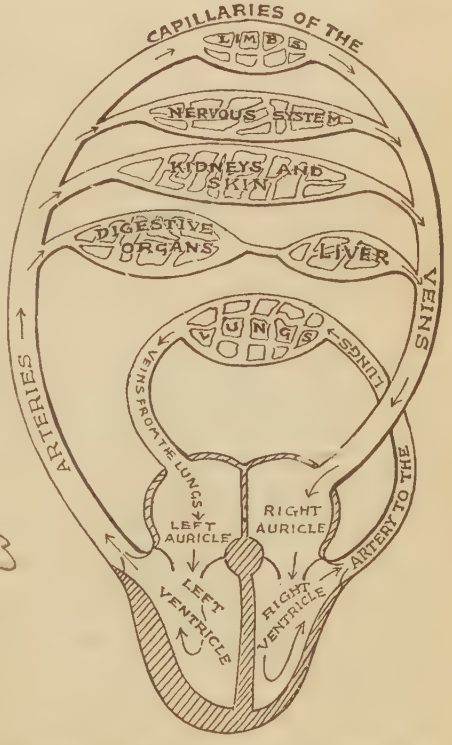


DIAGRAM OF THE CIRCULATION OF THE BLOOD

The arrows show the directions in which the blood flows.

then to the left side of the heart, and then to the finger again. It would do this in about half a minute.

The blood in the body is always flowing in a swift and endless stream. The only part of the stream which fails to return to the heart at once is the small quantity which passes through the sides of the capillaries into the flesh.

Tight Clothes. — Tight bands around any part of the body will press upon the veins and will hinder the flow of blood. Wear your clothing loose so that it will not press upon the blood tubes, but will allow the blood to flow freely. Tight garters around the legs may make the feet swollen and painful by pressing upon the veins. In place of garters that press against the skin it is better to wear stocking supporters that hang from the waist.

REMOVING A TIGHT FINGER RING

The string wound around the finger lessens the size of the finger by squeezing out the blood

A tight ring may press upon the veins and keep the blood from flowing out of the finger. Then the finger may become so swollen with blood that the ring cannot be taken off. One may squeeze out the blood by winding a small string round and round the finger, beginning at the tip. The ring may

then be slipped off while the finger is squeezed small.

Fainting. — A bad fright, or a sickness, or an injury may cause the heart almost to stop beating. The skin will then look pale, the brain will get but little blood, the mind will stop acting, and the person will fall down in a *faint.*

If you see a person fainting, lay him on his back, and keep his head low so that the blood may flow to it. Throw a little cold water into his face to rouse him. In a moment his heart will beat strongly again, and his mind will be as clear as before.

Tobacco and the Heart. — When a person is made stomach-sick by tobacco, he looks pale, because his heart is also poisoned and does not pump blood so well as it should. Even if tobacco should not make a person sick at once, yet it will often slowly weaken his heart. Many persons have to give up the use of tobacco because they cannot do hard work when they use it.

QUESTIONS

What two things does the blood carry to every part of the body?
What is the color of the liquid part of the blood?
Of what use is this part?
What makes the blood appear red?
Of what use are the red cells in the blood?
Of what use are the white blood cells?
What makes the blood flow throughout the body?
Where is the heart situated?
Why does the heart beat fast when a person runs?

10 Where may the pulse be felt?
11 What is the cause of pulse beats?
12 What is the name of the tubes that carry blood away from the heart?
13 What are capillaries?
14 What is the name of the tubes that bring blood back to the heart?
15 Where may veins be seen in the body?
16 In which set of blood tubes do food and air leave the blood and go to the flesh?
17 Why does a spot of skin become white when it is pressed?
18 Through what tubes does the blood flow in its circulation?
19 How may a tight ring be taken off a finger?
20 What should be done for a person who has fainted?
21 What does tobacco do to the heart?

For the Teacher. — This chapter gives the basic elementary facts regarding the blood and its circulation. The topics of tight clothes, fainting, and tobacco illustrate the results of a disturbance of the circulation. The other topics are of almost equal importance, and the descriptions are to be studied and learned.

Show the results of an obstruction to the free flow of blood by winding a small elastic band snugly, but not tightly, around the base of a finger. In about one minute the finger will swell and become purple, because the veins are closed, while the arteries remain open; and the finger becomes filled with blood which cannot flow out.

CHAPTER XVII

WOUNDS

Danger from Wounds. — The epidermis of a healthy skin will not permit poisons and disease germs to enter the flesh (p. 24). When the skin is cut or torn, poisons and disease germs may enter the flesh through the wound and make it sore. The poisons and germs may pass from the wound through the body and cause a dangerous sickness. The wound may also open a large blood tube and produce a severe bleeding.

When a person has a wound which breaks the skin, there are two things to do: first, to stop the bleeding; and second, to cover, or *dress*, the wound so that poisons and disease germs cannot pass through it and enter the flesh.

Bleeding. — If the skin is pricked with a pin, a drop or two of blood is all that will flow out, for the wound is very small. If the flesh is cut without touching an artery or a good-sized vein, there will be a little bleeding from the capillaries, but it will not be dangerous. If the gash cuts a good-sized vein, blood will ooze from it for a few minutes and will then stop flowing. A wound does not usually bleed for many minutes unless it opens an artery as large as a pin, or larger.

If a gash cuts a large artery, blood will spurt from it with each beat of the pulse. A small gash that opens an artery will bleed far more than a large gash that cuts only veins and capillaries. One or two cupfuls of blood may be lost without much harm, but the loss of a quart of blood is dangerous.

Most wounds do not bleed much, for there are only a few large arteries near the surface of the body. Nearly all of them lie deep in the flesh where they are out of the way of danger from small wounds. If the arteries in the skin were as large as the veins, the bleeding from every cut would be dangerous.

Clotting. — In about five minutes after blood runs from a cut, it becomes solid like jelly. This blood jelly is called a *clot*. The effect of clotting is to stop the bleeding. If a capillary, or a vein, or a small artery is cut, the blood will soon clot and stop the bleeding by forming a plug in the bleeding tube. If a large artery is cut, the blood may push the clot away as fast as it is formed, and then the bleeding will not stop without help.

First Way of Stopping a Bleeding

Grasp the flesh and hold the sides of the wound together.

First Way to Stop a Bleeding. — When any one is badly wounded, the first thing to do is to stop the bleeding. Do not waste time in looking for a cord, or a cloth, or a handkerchief, or a bandage, for you can stop a bleeding by pressing upon or around the wound with your fingers or hands. Do not be afraid

of the blood, but quickly grasp the flesh around the wound, and hold the sides of the cut together with your hands until a firm blood clot forms. You can easily squeeze the flesh hard enough to close the largest artery. In most cuts the bleeding will stop after you have held the wound for five or ten minutes.

SECOND WAY OF STOPPING A BLEEDING
Press a handkerchief upon the wound.

Second Way to Stop a Bleeding. — Crumple up a handkerchief and press it firmly on the wounded part. You can bind it in place by tying another handkerchief over it snugly enough to hold the cut artery tightly closed. Use clean handkerchiefs so that they will not carry dirt into the wound.

THIRD WAY OF STOPPING A BLEEDING
Tie a handkerchief around the bleeding part and tighten it by twisting it.

Third Way to Stop a Bleeding. — If a very large artery is cut, or if a finger, or arm, or leg is badly cut or torn, you may not be able to put a dressing over the wound tight enough to stop the bleeding. Then try a third way to stop the flow of blood. Tie a cord or handkerchief loosely around the bleeding part between

the wound and the heart, and tighten it by twisting it with your hand or a stick until it begins to press into the flesh. This will stop the bleeding in the largest arteries. But a wound will seldom bleed so much that the cord and stick will be needed.

STOPPING A NOSEBLEED
Hold the nostrils closed for four minutes, or until the blood clots.

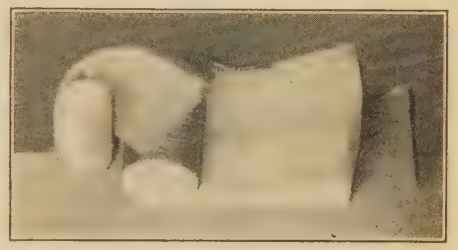
Nosebleed. — If your nose bleeds, sit still and hold the nostrils closed with your thumb and finger for five minutes while you breathe through your mouth. This will close the bleeding spot and allow the blood to clot. While your nose is bleeding, do not blow it, for that would blow the clot away from the bleeding spot and cause the blood to flow faster than before.

Dressing a Wound. — After bleeding in a wound has been stopped, the next thing to do is to cover the wound with a dressing. Strips torn from an old handkerchief, or from a worn-out sheet or undergarment will make good dressings, if they are clean.

HANDKERCHIEFS USED AS A DRESSING
Make a clean handkerchief into a pad and bind it into place with another one.

One of the best of all dressings consists of sheets of cotton called *absor'bent cotton.* Rolls of absorbent cotton may be bought at drug stores.

Place a layer of dressing on a wound and hold it in place with a bandage. A handkerchief makes a good bandage. Fold it cornerwise as if you were about to tie it over your eyes in playing blindman's buff. Lay the thick part over the wound and wrap the ends around the wounded part and tie them. You may also hold the dressings in place by using a roller bandage such as may be bought at a drug store.



GOOD MATERIALS FOR A DRESSING

Absorbent cotton, and gauze roller bandage. Both may be bought at a drug store.

ROLLER BANDAGE ON AN ARM

It is smooth and will not become loose readily.

A few disease germs may nearly always be found on the skin and in dirt on the skin. They may be killed with *iodine* (ī'ŏ-dĭn). If a cut is small, paint it and the skin around it with tincture of iodine before dressing it. A small bottle of tincture of iodine is a good thing to have in the house for use on wounds.

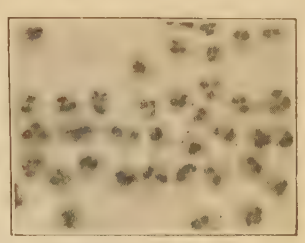
Finger Stall. — If a finger has been cut or is sore, you can easily dress it by wrapping it with a little absorbent cotton and putting it into a finger stall. The stall is made of muslin and is shaped like a glove finger. It has a strip reaching down the back of the hand, and strings on the end for tying around the wrist.

FINGER STALL
It is drawn over a wounded finger to hold a dressing in place.

Wet Dressing. — If the skin around a wound is dirty, or if the flesh around the wound is red and sore, wet the dressing with something that will kill the disease germs. Put a heaping tablespoonful of borax into a pint of clean boiled water, and pour some of the liquid on the dressing every hour or two, in order to keep it wet. Change the dressing every day. If the wet dressing is used, the disease germs will usually soon die, the soreness will pass away, and the wound will quickly heal.

Effects of Disease Germs. — If disease germs grow in a wound, the flesh will be red and sore and often swollen. Formerly, when a person had a wound in this condition, he was said to have *taken cold* in the wound, or to have *blood poisoning* in it. The harm was supposed to be caused by cold air and dampness; but this belief was wrong. The soreness, redness,

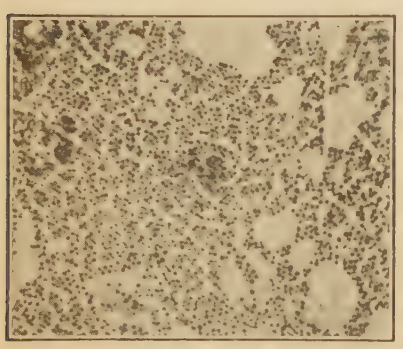
and swelling are caused by disease germs which grow in the wounded flesh. If a wound contains disease germs, it will be sore for many days, and will heal very slowly. But if a wound is kept free from disease germs, it will not be sore or painful, but the flesh will grow together and heal in three or four days.



White Blood Cells

(Magnified 500 times.) Pus consists of white blood cells that have been killed by disease germs.

A white, creamy matter, called *pus*, often runs from a sore wound. The pus is mostly white blood cells which were killed while they were trying to destroy disease germs (p. 137). Pus in a cut or wound is a sign that disease germs are growing in the flesh. The white matter in a pimple or boil is pus, and is usually caused by disease germs growing in the skin around a hair root. Use a wet dressing upon a wound that is red or sore, or that gives off pus.



One Kind of Disease Germs Which Produce Pus

(Magnified 1000 times.) This kind is the one which is the usual cause of pimples and boils.

Washing a Wound. — When you give first aid to a wounded person, do not wash the wound. The water

with which a wound is washed may have disease germs in it, or it may carry disease germs from the skin into the wound; and so washing a wound is likely to do more harm than good. Let the blood remain in the wound and soak into the dressing, for blood itself is a good dressing, and will help to kill disease germs. After you have put a first-aid dressing on a wound, call a doctor or nurse, who will wash and cleanse it, and dress it in the proper way.

QUESTIONS

What are two great dangers from wounds?
How much blood may be lost without danger?
In what way does a cut artery bleed differently from a cut vein?
Of what use is the clotting of blood?
If you should see a person bleeding badly from a wound, what is the first thing you would do to stop the bleeding?
What is the second thing to be done in stopping bleeding?
What may be done to stop the bleeding when a very large artery is cut?
How may a nosebleed be stopped?
What harm comes from disease germs in a wound?
How may disease germs be kept out of a wound?
How should you dress a wound?
Of what use is *iodine* in dressing a wound?
Why should you not wash a wound?
How should you put on a first-aid dressing?
How should you use handkerchiefs as a dressing and bandage?
How should you use a finger stall?
What is meant by *taking cold* in a wound?
What is pus?
What is the cause of pus in a wound?
What is a wet dressing? How should you use it?

For the Teacher. — This is a most practical chapter. The three methods of stopping a bleeding are those which a physician or trained nurse uses, and which any pupil can readily learn. There is no need to burden the memory with the distinctions between arterial and venous hemorrhages. The point is that pressure will stop the bleeding, whatever its source may be. The simplest and quickest way to make pressure is to use the fingers or hands. These are always available and sufficient. Use the fingers or hands without hesitation to stop the immediate flow, and then take time to think what further steps are necessary, and to secure handkerchiefs, dressings, bandages, or a tourniquet. Only very rarely will a tourniquet be necessary. Do not use one unless all other means fail.

Teach the simplest way to apply a first-aid dressing to a wound, — which is to bind a clean handkerchief or other dressing rather firmly upon the wound *without washing it.* The blood itself is one of the best dressings. Wash the skin after the dressing has been applied.

A wet dressing is simply one which is kept wet with a disinfectant, or even with boiled water. Use a wet dressing on two kinds of wounds and sores:

1. Those which are dirty.

2. Those which are red, or inflamed, or swollen, or contain pus. No harm will be done by using a wet dressing on any wound.

One object of an old-fashoned poultice was to cause pus to form. This is the very opposite of the modern object of a dressing. A wet dressing will do all the good that a poultice was expected to do, and in addition it will help to kill disease germs in the skin.

CHAPTER XVIII

FIRST AID

Fright. — When an accident occurs, those who see it are often too frightened to help those who are hurt. If you are hurt, or if you see some one else hurt, do not cry out, or shout, or run around, but keep quiet for a few seconds and try to think. Then you will soon be brave and cool, and can see what the matter is, and can also think what to do.

When you try to help a person who is hurt, look for three dangerous injuries:

1. Shock. 2. Bleeding. 3. Broken bones.

Shock. — A person who is hurt is often in a state of mind called *shock*. When you have a hard fall, or are struck a hard blow, you have a feeling of shock. A person who is mildly shocked is dazed and dizzy, and cannot speak for a moment. One who is badly hurt and shocked may be faint, or unconscious and helpless.

A person who is in a state of shock cannot help himself. You can help him by doing two things:

First, carry him to a safe place where he will be out of danger of being hurt more.

Second, lay him down with his head low, so that blood can easily flow to his brain.

These two things are about all that you can do to help a person in a state of shock. Do not rub him, or shake him, or disturb him, for thus you may make the shock worse. But look him over gently to see if he is bleeding or has a broken bone.

Pain. — Nearly every person who is hurt feels pain in the wounded part. A person who is crying with pain is not in so much danger as one who is in a state of shock, and is so dazed or unconscious that he cannot cry out.

Bleeding. — If there is any bleeding, try to stop it at once, for a person may bleed to death before a doctor can be called (p. 146).

Broken Bone. — If a bone of an arm or leg is broken, the limb will be painful when it is moved. The pain is caused by a bending of the bone, and may be lessened if the bone is held straight.

A Broken Arm in a Splint

A thin, narrow board tied with two handkerchiefs makes a good first-aid splint for a broken arm or leg.

The thing to do for a bone that is badly broken is to bind a stick or a thin board along the whole length of the limb so as to keep the bone from bending. Then the injured person may be carried home without danger to the broken part.

Bruise. — When the flesh is bruised by a blow or a fall, some of the capillaries will be torn. A little

blood will then flow out and make a bluish stain under the skin. A bruise is not usually dangerous if the skin is not broken, for the skin will keep disease germs out of the flesh. Soaking the bruised spot in hot water will help to stop the bleeding and to ease the pain.

Splinters in the Skin. — A splinter or thorn in the skin makes a hole through which disease germs may pass into the flesh. If you get a splinter, or a thorn, or a needle in your flesh, have it taken out as soon as possible. If the flesh becomes sore, cover the spot with a wet dressing so as to kill the disease germs that may be in the flesh (p. 150).

DISEASE GERMS OF LOCKJAW

(Magnified 1000 times.) They are often found in garden soil and are likely to enter wounds of the feet.

Lockjaw. — Many persons are wounded by stepping on nails and other sharp things which lie on the ground. These wounds are likely to be dangerous because the germs of lockjaw may often be found in the ground and may be carried deep into the flesh. Wounds made by stepping on nails on the ground are more dangerous than the same kinds of wounds made in other ways.

If you run a nail into your foot or hand, put a wet dressing upon the wound (p. 150) and then go to a doctor and have it examined and treated. Lockjaw antitoxin, given soon enough, will prevent the disease.

Wounds made by firecrackers and other fireworks are also likely to contain germs of lockjaw. If you receive a bad burn on the Fourth of July, go to a doctor at once and have the wound dressed.

Bee Stings. — When bees or wasps sting the skin, they leave a poison which makes the flesh smart and swell. There is no danger from the stings unless they are very numerous. Putting a little ammonia and cold water on the part that has been stung will help to stop the pain.

Usually when bees or wasps buzz around you, they will not sting if you do not make a sudden motion.

Clothes Afire. — When your clothes are afire, the first thing to do is to lie down. Then the fire will not spread fast, just as the flame will not spread on a burning match when it lies flat. Also roll over and over to crush out the flames.

If you see a person with his clothes afire, throw him to the ground and roll him over and over. If you can get a coat, or blanket, or carpet quickly, wrap it round him. This will help to smother the fire.

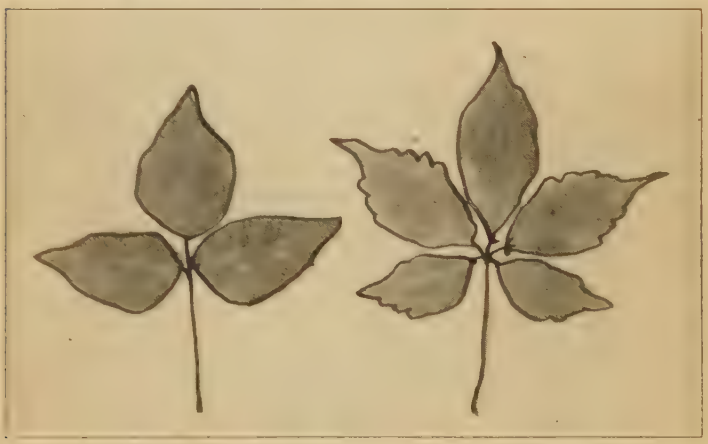
Burns. — One of the best things to do for a burn or a scald is to hold the burned part in cold water until it can be dressed. Bandage the burn just as you would a wound, and soak the dressings in an oily liquid. A good thing to use is a mixture of linseed oil and lime-water. This makes a yellow liquid called *carron oil.*

Blisters. — If the skin is rubbed hard, or burned, its epidermis may become loosened and puffed up with

blood serum, in a *blister*. It is best to let a blister alone until it dries up. If a blister becomes broken, dress it as you would a wound.

Poison Ivy. — The skins of some persons will become sore and blistered a day or two after they have touched poison ivy or swamp sumac. If you have been near the plants, you can get rid of the poison by scrubbing the hands and face well with soap and hot water. If you do this as soon as you can, you will probably not be poisoned.

Poison ivy is a vine that creeps over trees, fences, and stone walls. It looks much like a harmless vine called Virginia creeper, but each leafstalk of the poison



POISON IVY VIRGINIA CREEPER

Poison ivy leaves are in threes; Virginia creeper leaves are in fives.

ivy bears three leaves, while each leafstalk of the Virginia creeper bears five leaves.

Sunburn. — The bright sun shining on the skin may make it red and sore, and may sometimes cause blisters. After a person has been in the sunlight for a few days, the outer part of the skin will produce a brown coloring matter called *tan*. The tan is like a dark curtain. It tends to keep the light from reaching the flesh and burning it. You can keep from being sunburned by letting the sun shine upon your skin for only a short time each day until the tan is formed.

QUESTIONS

When a person is hurt, for what three dangerous injuries should you look?

What is *shock*? What should be done for a person in a shock?

What should be done to help a person who has a broken bone?

What is the cause of the bluish stain of bruised flesh?

What should be done for a bruise?

What is the danger from a splinter in the flesh?

What is the danger from a wound made by stepping on a nail? What should be done for the wound?

What should be done for insect stings?

How may the flames be put out when a person's clothes are afire?

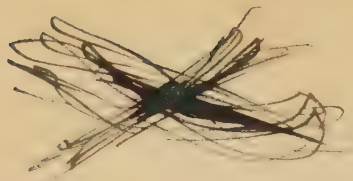
What should be done for a burn? for a blister?

What should be done to prevent poisoning by poison ivy?

How can you tell poison ivy from Virginia creeper?

What is tan? Of what use is it? How can you prevent sunburn?

For the Teacher. — This chapter deals with some of the most common conditions in which any one may be called to give first aid. The very first essential is that the person giving first aid shall know where the danger lies, and shall not do more harm than good to the sufferer. One standard method of dealing with each emergency is given. Have the pupils memorize this method.



CHAPTER XIX

SAFETY FIRST

Dangers in Olden Times. — When the first settlers came to America, the Indians were often in danger from wild beasts and from their enemies. If an Indian did not keep watch all the time, he was liable to lose his life or the lives of his wife and children. He and his family lived by keeping watch against the dangers of wolves and panthers, and of Indians with whom his tribe was at war.

Present Dangers. — We are no longer in danger from wild beasts or deadly enemies, but yet we are in about as much danger as an Indian formerly was. About 100,000 persons are killed in the United States every year, and five times that number are badly hurt. This means that one person in every two hundred inhabitants will be badly hurt during the year; and that in a large school two or three children will be wounded or killed. Automobiles kill about 10,000 persons in the United States every year, and machinery about as many more. While we to-day have many comforts of which the Indians knew nothing, we are also in danger from many things which did not trouble an Indian. A modern girl or boy must needs watch out for his life more carefully than a young Indian.

Causes of Present Dangers to Life. — The dangers to an Indian were largely hidden and came from beasts and enemies that kept themselves out of sight as they crept upon him. But most modern dangers are from things which are in plain sight. We can guard against dangers to life much more easily than an Indian could. Failure to keep ourselves from accidents is due to four principal causes:

1. *Ignorance.* — You may wish to do the right thing, but you may not know how, and may need to be taught.

2. *Carelessness.* — You may know how to be on your guard, and yet may be thoughtless. If so, you need to wake up.

3. *Mischief-making.* — You may know how to act and may be careful, and yet you may choose to make trouble for some one else. The mischief-maker deserves to be punished.

4. *Daring.* — Some boys and girls who are careful and thoughtful do dangerous things foolishly, just because some one dares them to do so. Pay no attention to the person who dares you to do something.

Safety First. — Many dangers are always about us. Automobiles are nearly always in sight upon a street, and factories and shops with whirling machinery are in every town. The dangers are so common that we get used to them and often forget to be on our guard. We are often tempted to hurry and take chances of escaping dangers, but looking out for safety first is the only sure way of preventing injury.

Reporting Unsafe Things. — It is the duty of every man, woman, and school child to tell the policeman, or janitor, or teacher, or other responsible person, about any unsafe thing which is seen. Among the things which should be reported are:

Broken or missing guard rails around a cliff or stairway.

Worn stairs.

Gulleys in a road after a storm.

Broken chairs and seats.

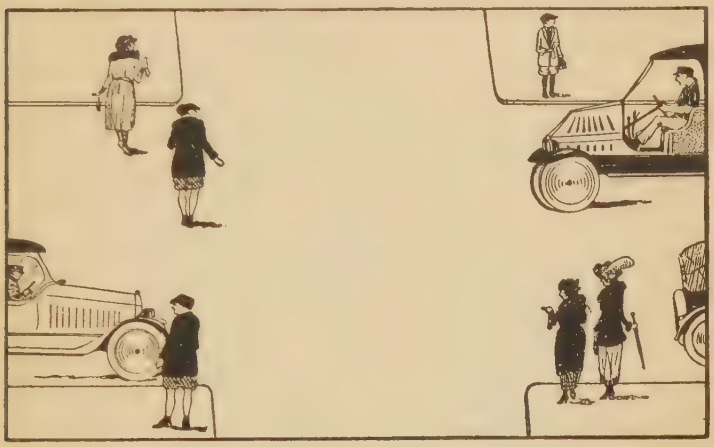
Nails or pieces of glass strewn along the road; but if there are only a few of them, pick them up and do not wait for some one else to come along and do it.

Many persons say, "It is none of my business." It is your business, for you are one of the people and you depend upon others to protect you. Do your part to protect others.

Safety Signs. — It is almost impossible to make everything so safe that there is never any danger, but many danger spots are marked. All railroad crossings are marked by big signs, some of which say, "Stop! Look! Listen!" Such a sign means exactly what it says, and if a sign were not in plain sight, many persons would not know that a railroad was crossing the road just ahead. Many railroads employ lecturers to visit schools to urge the children to give heed to the signs.

How to Cross a Street. — When you cross a street, remember that automobiles travel on the side of the

road which is on the right-hand side of the driver. When you start to cross, the automobiles coming toward you are on your left, and when you pass the



How to Cross a Street

When you start across, watch out on your left. When you pass the middle of the street, watch out on your right.

middle of the street, they are on your right. Remember the following rules in crossing a street:

1. When you are ready to cross, look both ways, — to the left and to the right, — and be sure there is room for you to pass.

2. When you start across, look out for automobiles on your left, but when you reach the middle of the street, look out for those on your right.

3. If you are in the way of an automobile, wave your hand to signal the driver which side of you you wish him to go.

4. If you are in a city, cross the street only at a corner, and not in the middle of a block.

5. If a traffic policeman is on duty, watch for his signal before you start to cross the street.

You see there are many things to think about in doing such a simple thing as crossing a street.

How to Get on and off a Car. — There are several things to remember in getting on or off a street car or automobile:

1. Go on the right side of the car. It will be on the side nearest to the curb, where no other car is likely to pass by you.

2. Wait for the car to stop.

3. When you get on the car, grasp the car or its handle with your *right* hand and step up with your *left* foot first. If the car should start, you will be in the best position to hold yourself upright.

4. When you get off the car, do so from the right side, and face the direction in which the car is going. Grasp the handle with your *left* hand and step off with your *right* foot first, so that if the car should start, you can keep your balance by taking a few steps forward.

How to Care for a Bonfire. — Children are sometimes told to rake the yard and burn the rubbish. There are several things to think about in making a bonfire:

1. Choose a time when little or no wind blows, and when its direction is away from anything that might catch fire or be harmed.

2. Choose a place at some distance from a building.

3. Make only a small fire and put only a small quantity of stuff on at once.

4. Stay by the fire until it is out. Do not leave it smoldering and smoking.

5. Cover the ashes with soil or pour water over them. Be sure that there are no coals or sparks left to blow about.

Explosive Liquids. — Many fires are started by means of explosive liquids, such as gasoline, kerosene, and alcohol. Stoves burning kerosene are often used in cooking, and gasoline is used in cleaning clothes. Some form of alcohol is used in many varnishes. All these substances give off vapors which easily take fire and may set fire to cans full of the substance. A can may explode and throw the burning liquid upon a person. It is dangerous to handle any of these liquids near a burning light or fire. They are too dangerous to be handled by children.

Dangers to Health from Carelessness. — Many accidents happen because some one is thoughtless or careless, or is selfish and does not care for the rights and comforts of other persons. Some of the dangerous things which are done by careless boys or girls, are:

Playing on streets which are not set aside for play.

Making icy slides on sidewalks.

Throwing banana peels and fruit skins on sidewalks.

Wrong Way

Right Way

To Use a Jackknife

Do not cut toward your hand or body. Always cut away from your hand or body.

Pulling a knife toward the body when cutting, instead of pushing the knife away from the body.

Throwing stones or sticks toward persons, or into places in which some one may be out of sight.

Pointing guns or air rifles at any one.

Leaving things in hallways, especially dark halls.

Sitting with the feet in the aisle at school.

Practical Jokes. — Many accidents or injuries are the result of practical jokes which are played in order to annoy some one or to get some one into trouble. It is mean as well as dangerous to injure any one who trusts you. Some forms of practical jokes which are dangerous to health are:

Hiding one's hat or coat.
Tripping or pushing another.
Putting a tack or pin in a chair.

A harmful kind of practical joke is that of frightening a child. Anything that makes a child afraid of the dark or of ghosts or of crawling things, does that child a great harm. It spoils sleep and keeps a pupil from putting his mind on his lessons. It is also often hard to overcome these fears, and many persons suffer from them all through life because some big boy or girl frightened them while they were young.

Daring. — Many accidents and injuries happen because some one is foolishly daring, and tries to show off before others. Some of the dangerous things which are often done in a daring way are:

Coasting on a public street.
Going on thin ice.
Jumping through bonfires.
Touching fallen electric wires.
Doing " stunts " in the game of " Follow the Leader. "

A thoughtful boy or girl can do much to keep others from doing dangerous things. Boys and girls like to follow a leader who is known to be careful.

QUESTIONS

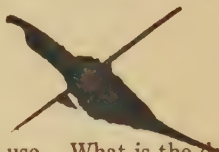
What dangers to life did the Indians have to face?
What dangers do modern people in the United States have to face?
How many people in the United States are killed by accidents each year?

Give four reasons why modern people meet with a great number of accidents.

If you see an unsafe thing, what is your duty?

Why are safety signs placed at dangerous places?

What is the meaning of the sign at a railroad crossing, — "Stop! Look! Listen!"?



Give some rules for crossing a street.

How should you get aboard a car?

How should you get off a car?

How should you care for a bonfire?

Name some explosive liquids in common use. What is the danger from them?

Name some common dangers to life or health which are due to carelessness.

What is the danger from practical jokes?

In what respect is a practical joker a mean person?

Why is it foolish to yield to any one who dares you to do something?

For the Teacher. — Safety first can best be taught by taking advantage of events which occur at school, or of local accidents which are known to the pupils, and discussing the topic or principle which is involved.

Little good will come from merely warning pupils, but great good may be accomplished by giving instructions regarding the basis of the warning. For example, it does little good to tell a pupil, "Be careful when you cross a street," but the pupil will be interested and impressed by an explanation of the reason for rule 2 on page 163.

Emphasize the need of care in fire protection. Explain the three great causes of fires:

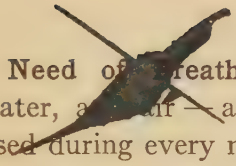
1. The careless use of matches.
2. Allowing inflammable rubbish to collect in buildings or near them.
3. Lighted cigarettes or cigar butts.

Have each pupil find out the location of the fire alarm box nearest to his home; also the nearest fire hydrant.

Emphasize the value of courtesy, obedience, generosity, and good manners in preventing accidents and injuries. Explain the danger which comes from an excessive idea of personal independence which Americans have, leading to disrespect for law, and to accidents and injuries. Cite speed mania as an example.

CHAPTER XX

BREATHING



Need of Breathing. — Three substances — food, water, and air — are taken into the body, and are used during every moment of life. The body gets its air by breathing. Every living thing must have air in order to live. Air is a gas, and yet the weight of the air which the body uses in a day is greater than the weight of its daily food.

Breathing, and the uses to which air is put in the body, are called *respira'tion*. The changes produced by respiration are like those which take place in a fire.

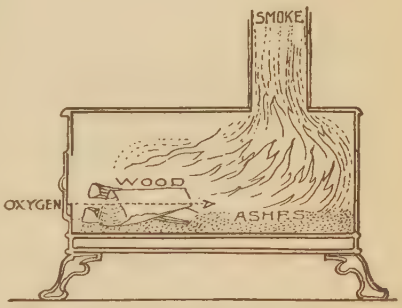


DIAGRAM OF OXIDATION IN A STOVE

When a fire burns, oxygen from the air unites with fuel; and the two give off heat and become smoke and ashes.

Oxidation in a Fire. — When a fire burns in a stove, air from the draft unites with the fuel in the fire box, and the air and fuel together become changed to smoke and ashes. Not all of the air from the draft is used in the burning, but only that part which is called *oxygen* and which forms about

one fifth of the air. The joining of oxygen to the fuel is called *oxida'tion.*

Oxidation in the Body. — Oxidation like that in a stove is always going on in every living body. The

OXIDATION IN THE BODY

The warmth and strength of the body come from the oxidation of its food and flesh.

fuel which is oxidized in the body is food and living flesh, and the oxygen comes from the air which is breathed into the body.

Oxidation produces heat. In a fire oxygen unites with the fuel rapidly enough to make great heat and a flame. In the body oxidation goes on slowly and gently, and yet the oxidation of food and flesh keeps

the body warm, and produces the same quantity of heat that the food and flesh would have made if they had been burned in a stove.

Oxidation also produces power. When you run or do other work, the strength which you use comes from the oxidation in your body, just as the power of an automobile comes from the burning gas in its engine.

Breathing. — The object of breathing is to supply the body with oxygen. A person takes a breath by raising the ribs, thus making the upper part of the body larger. This allows air to flow into the body. He expels a breath by letting the ribs fall, thus making the upper part of the body smaller. A grown person usually breathes from fifteen to twenty times in each minute, or once every three or four seconds.

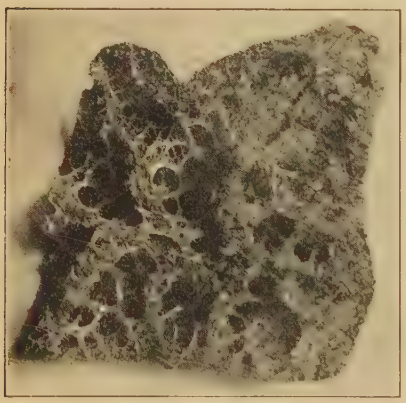
MEASURING THE CHEST
A healthy ten-year-old boy can expand his chest two or three inches.

If you can increase the size of your chest a great deal when you take a breath, you will be able to take a great deal of oxygen into your body and will be likely to be "long-winded." Put a tape measure around your body just under the arms, and see how much larger you can make your chest by taking a deep breath. An increase of two inches is large for a

half-grown boy, and an increase of four inches is large for a grown man.

Lungs. — Air passes from the nose or mouth, through the throat, into a tube called the *trachea* (trā′kē-*ā*), or *windpipe*. The windpipe divides into small tubes called *bronchi* (brŏng′kī), and the bronchi open into the *lungs*.

The lungs are two masses of flesh which fill most of the upper part of the body under the ribs. Their use is to supply oxygen to the body. They are full of tiny air spaces. When a breath is taken, these spaces are filled so full of air that the lungs become large, like a blown-up balloon. When a breath is blown out from the body, the air spaces are partly emptied.



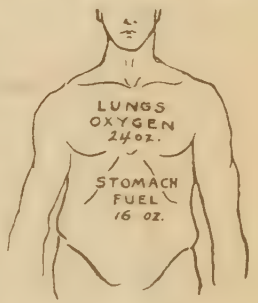
LUNG OF A TURTLE

(Natural size.) The air cells make the inside of the lung look like a sponge. A man's lung is like a turtle's lung except that the air cells are very much smaller.

The walls of the air spaces are covered with capillaries through which blood is always flowing. While the blood is passing through these, the red blood cells take up oxygen from the air in the air spaces. The blood then flows through the body and carries the oxygen with it to all the flesh.

A little oxygen also is taken from the air by the blood that flows through the skin. If the walls of the air spaces in the lungs were all opened and spread out, they would make a sheet large enough to cover the whole body sixty times. The blood can therefore take from the lungs sixty times more oxygen than it could get if it had to take all its oxygen from the skin.

What the Body Does with Oxygen. — When the blood reaches the capillaries of the arms and legs and of other parts of the body, the oxygen leaves the red blood cells, and unites with food and flesh, and oxidizes them. The weight of the oxygen that the body uses each day is more than the weight of all the food and flesh that is oxidized.



WEIGHT OF OXYGEN AND OF FOOD

The oxygen used daily in the body weighs more than the solid food.

The oxidation within the body produces waste substances which consist of oxygen joined to food and flesh. They are like the smoke and ashes of a fire, and are harmful to the body. They are taken up by the blood and are carried away in its stream. One of the principal waste substances is called *carbon dioxide* (dī-ŏk′sīd). This gas is carried to the lungs, and there is given off to the air spaces, and is breathed out with the breath. Other waste substances are given off by the skin and kidneys and other organs.

Arterial and Venous Blood. — The same blood stream which carries food and oxygen also carries waste substances. The blood that is flowing away from the heart through most of the body is called *arterial* blood because it is flowing through arteries. The arterial blood contains an abundance of oxygen and only a small quantity of waste substances, and is bright red in color.

The blood that is flowing from nearly all parts of the body toward the heart is called *venous* (vē′nŭs) blood, because it is flowing through veins. Most venous blood contains a great deal of waste substances and only a little oxygen, and is dark red or purple in color.

Blood changes from arterial to venous in all the capillaries of the body except in those of the lungs. In the capillaries of the lungs the blood changes from venous to arterial (p. 141).

Breathing and Life. — The fire in a stove uses up oxygen as fast as air passes through the draft, and burns very slowly when the drafts are shut. When a person stops breathing, the oxidation in his body goes on too slowly to support life, because of the lack of oxygen. When the oxygen in the body is nearly used up, a great shortness of breath is felt. All the oxygen that the lungs and blood can hold will not last the body longer than about a minute. If a person should not breathe for two minutes, his life would be in great danger. A person must breathe fifteen or twenty times a minute in order to feel comfortable.

Breathing and Strength. — When you run hard, you quickly use up all the oxygen which your blood can carry. Then you feel short of breath and have to rest until the blood can take up more oxygen. Thus your breathing will have a great deal to do with your strength. You can work as hard as your breathing will allow. If your lungs are large and you breathe deeply, you will be able to run fast and do other hard work. One reason why physical training, athletics, and military drill will increase your strength, is that they will teach you to breathe so deeply that you will not get out of breath easily.

Breathing and Health. — Your breathing has a great deal to do with your health. If oxidation does not go on properly, the waste substances of your body will be like the gases in a coal stove that does not burn well. They will be more poisonous than they should be, and your body will not be able to get rid of them easily. They will make you feel weak and dull, and they may make you dangerously sick. Many persons are weak and in poor health because they do not take enough oxygen into their bodies to carry on oxidation in the right way.

Overeating and Oxidation. — When a person eats too much food, the lungs do not supply enough oxygen to oxidize the food properly. The poisonous waste matters of the body then cause headaches and backaches, and the pains which are often called rheumatism. A cure for many of the aches and pains is to go

without food for a meal or two, in order that the food that is already in the body may be oxidized. Another cure is to take hard exercise in order to increase the quantity of oxygen in the body.

Exercise and Breathing. — The principal way by which you can cause the oxidation in the body to go on properly is by taking exercise. When the muscles are put to hard use, the body becomes warm, and the breathing is deep and fast, for a great deal of food and oxygen is used up. Then oxidation is perfect, just as it is in a stove when the fire is hot and the drafts are open wide.

When a fire is once well started in a stove, and the drafts are nearly closed, it will burn slowly and steadily for some hours. The oxidation in the body does not need to take place rapidly all the time, but it will go on too slowly unless some exercise is taken two or three times a day.

Deep Breathing. — Another way of making the oxidation in the body go on properly is by taking deep breaths often. After you have been sitting still for some time, you may feel dull and short of breath because you take too little oxygen into your body. Then you may make yourself feel bright and comfortable by throwing your shoulders back and breathing deeply. Taking deep breaths of air will often help you to learn your lessons when you begin to feel dull and sleepy.

Deep Breathing and Health. — Dust and disease germs are often breathed into the lungs. If deep

breaths are not taken, only a part of the lungs will be filled. Then the germs may lie in a still corner of the lung. There they may grow undisturbed and cause a lung disease. Those who have tuberculosis usually have small, flat chests, and do not breathe deeply. If you take deep breaths several times a day, fresh air and blood will fill every part of the lungs, and disease germs will have but little chance to grow there. Deep breathing is one of the best of all means for keeping the lungs healthy and strong.

Mouth Breathing. — The folds of the inside of the nose warm the air which is breathed, and strain out dust and disease germs from it (p. 53). The mouth cannot do this nearly so well as the nose can. If air is breathed through the mouth, cold air, dust, and disease germs will pass into the throat and lungs. Those who breathe through their mouths are likely to catch colds, sore throats, and diseases of the lungs.

Many persons think that it is natural for a child to breathe through his mouth. This is not so. A child will breathe through his nose if it is clear and open, and will keep his mouth closed at night as well as in the daytime. If you have to breathe through your mouth while you are at rest, go to a doctor and have your nose and throat treated. The most common cause of mouth breathing is adenoids (p. 56).

Stooped Shoulders. — When you sit or stand with the shoulders bent forward, your arms will hang like weights upon the chest. Then you will not be able

to breathe well, but will feel short of breath and uncomfortable.

While you are writing or studying, sit up straight and throw your shoulders back, so that your arms

Wrong Position at a Desk

Right Position at a Desk

When you work at a desk, sit upright and keep your shoulders thrown back.

will be supported by the muscles of your back. Then you will be able to breathe freely, you will feel bright and active, and will be ready for hard work or play.

Artificial Respiration. — When a person has been almost drowned, he may be brought back to life if air is made to pass into and out of his lungs as in breathing. This is called *artificial respiration.* If artificial respiration is begun within a few minutes after a drowning person has stopped breathing, it may save his life.

Learn how to do artificial respiration, for it is easy to learn, and by doing it you may be able to save a life when no doctor is at hand.

In order to do artificial respiration, prepare the rescued person in the following way: Lay his body out straight on the ground, or floor, *face downward.* Turn his head to one side and place his arm under it. Kneel astride him over the upper part of his legs and place your hands on the sides of his body just above the waist line, — your thumbs on his back and your fingers on his sides.

ARTIFICIAL RESPIRATION, FIRST MOVEMENT
Press upon the sides of the chest in order to squeeze the ribs together and force the air out of the lungs.

You are now in a position to begin the movements, which are two in number:

1. Say "Out goes the water." As you say the word "Out," lean your body forward so that your weight rests on your hands.

ARTIFICIAL RESPIRATION, SECOND MOVEMENT
Suddenly stop pressing upon the chest. The ribs spring up and draw air into the lungs.

2. Say "In goes the air." As you say the word "In," throw your body back by pushing suddenly upon your hands. You will hear the air passing into the lungs as you sit upright.

Make these movements while you repeat the two sentences over and over in a natural way. These movements will cause the chest of the rescued person to imitate the natural movements of breathing.

Keep up the movements of artificial respiration until the person begins to breathe. You may have to do them for an hour or two before the person is out of danger.

Electric Shock. — A strong shock of electricity may stop a person's breathing and make him seem to be lifeless. Then the person may often be brought back to life by means of artificial respiration just as in the case of a person saved from drowning.

Choking. — If a person's windpipe is stopped up, we say that he *choked*. Some persons have a habit of holding pennies or buttons or other small things in their mouths. Sometimes a small object is sucked into the windpipe and cannot be taken out. It is dangerous to carry anything in your mouth when you are at work or play, for it may slip down the throat and cause choking.

If any one is choking, he needs help quickly. The first thing to do is to hold him so that his head hangs down. You can hold a child up by the feet, and you can lay a grown person, face downward, across a chair with the head hanging down.

The next thing to do is to shake the choking person, or slap him on the back, so as to make the object drop out of the windpipe.

QUESTIONS

1. What substance from the air is used up in a burning fire?
2. What is oxidation?
3. How is the oxidation in a living body like the burning in a stove?
4. What substance does breathing supply to the body?
5. How much should a person be able to expand his chest in taking a deep breath?
6. What are the lungs?
7. How does the blood get oxygen from the lungs?
8. What does the blood do with oxygen?
9. What is done with oxidized substances in the body?
10. What is the difference between arterial and venous blood?
11. What is the cause of shortness of breath when a person runs fast?
12. How does overeating disturb the oxidation in the body?
13. What effect does alcohol have on the oxidation in the body?
14. Why is it healthful to take deep breaths often?
15. What harm comes from breathing through the mouth?
16. What harm comes from sitting or standing with stooped shoulders?
17. Of what use is artificial respiration?
18. How may artificial respiration be done?
19. What should you do for a person who has been shocked by electricity?
20. How can you help any one who is choking?

For the Teacher. -- Teach the subject of oxidation as the fundamental action in breathing, in the production of strength and heat, and in doing work. Show the similarity between the oxidation in the body and that in a stove. This similarity will help to explain the relation of oxidation to life, strength, and health. It will also explain the bad effects of overeating.

Have the pupils practice artificial respiration upon one another, saying the sentences slowly and deliberately, and at the same time making the movements as directed in the text (p. 179).

CHAPTER XXI

FRESH AIR

How Air Is Made Impure. — If a person stays in a small, closed room for an hour, a large part of the oxygen of the air will be used up, and its place will be taken by waste substances from the body. Then the air of the room will not be fit for breathing. If a person should be shut in a small air-tight room for a few hours, he would die from lack of oxygen.

A lighted lamp also makes the air of a room impure, for it uses about as much oxygen as a man, and gives off nearly the same kind of waste substances. Air in houses may also be made impure by dust and dirt in the rooms, and by decaying substances in the cellars.

Disease Germs in Foul Air. — When any one talks, or coughs, or sneezes, or blows the nose, tiny drops of mucus or saliva often fly from the nose and mouth. These drops of liquid contain disease germs when they come from some one who has a cold, or tonsillitis, or tuberculosis, or other disease which is catching. The drops soon dry and their disease germs may float in the air as dust. Then the next person who breathes the air may catch the disease.

Many persons have sore throat, tuberculosis, or other diseases in a form so mild that they keep at their work and go among other people just as if they were well. These persons often give off disease germs just

as they would if they were severely sick. For this reason, any air which has been made impure by breathing is likely to have disease germs in it.

Effects of Foul Air. — While any one is breathing foul air, he feels lazy and dull, and cannot do good work. Pupils in a close schoolroom cannot put their minds on their lessons. Those who breathe foul air day after day are likely to be weak and sickly.

The worst effects of foul air are caused by disease germs which are nearly always found in it. The dusty air of living rooms and meeting places is likely to contain disease germs. The cleaning of rooms in which persons live and work is necessary in order to keep the air pure (p. 35).

How to Know Impure Air. — You can usually tell foul air by its smell. Air that has been made impure by the breathing of persons has an unpleasant odor. If you can smell this when you come into a room, you may know the air of that room is unfit for breathing.

After you have been in a room full of foul air for a few moments, you may no longer notice the odor, but the air will still be as harmful as when you entered the room. If no one could become used to the smell of foul air, all persons would be likely to keep the air of their houses pure and fresh. But because the sense of smell soon becomes dulled, many persons fail to notice when the air of their houses becomes impure. They often keep on breathing foul air, and thus do a great deal of harm to their health.

Purity of Outdoor Air. — The way to keep the air of a room pure is to change it often for pure air from out of doors. Outdoor air is nearly always pure. People give off impurities from their lungs when they are in the open air, just as they do when they are in houses. But outdoors the wind supplies new air, and carries impurities away as fast as they are formed. In a closed room the air is breathed over and over again, and is soon made impure.

Ventilation. — Changing the air of a room for fresh, outdoor air is called *ventilation*. Some fresh air comes into a room when the doors are opened, and some comes in through cracks in windows, doors, and floors; but in a well-made house the cracks are too few and too small to let enough fresh air into a room.

The simplest way to ventilate a room is to open a window in it. But an open window may allow cold air to enter a room in a large stream called a *draft*. Many persons do not ventilate their rooms because they suppose that a draft of cool air will cause them to take cold. A draft will not be the cause of a cold if the air is fresh, for there will be no disease germs in it. A person may catch cold by breathing disease germs from the foul air of a room, whether there is a draft in it or not. You can easily ventilate a room without producing a draft.

Warmth and Ventilation. — The air of a heated room is warmer near the ceiling than near the floor, for warm air is lighter than cold air, and rises above

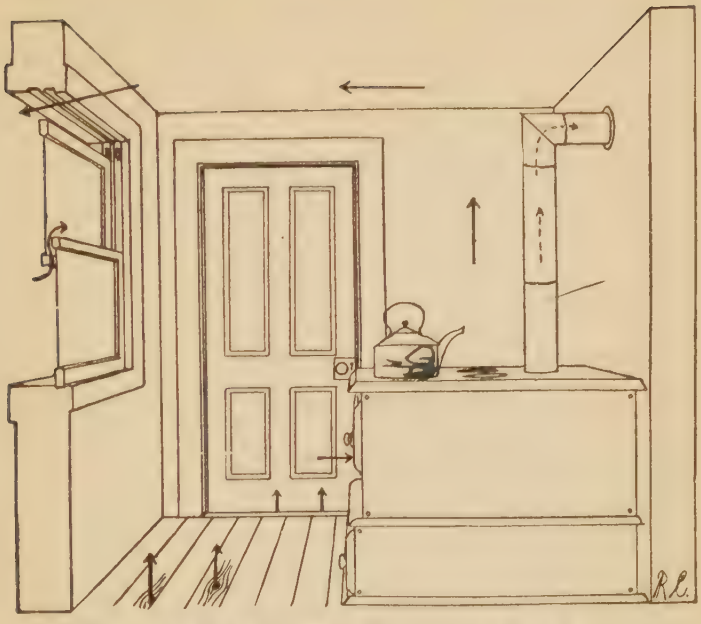


DIAGRAM OF THE NATURAL VENTILATION OF A ROOM

Air enters the room through cracks in the floors, and the lower parts of the windows and doors. Air leaves the room through the upper parts of the windows and doors and through the chimney.

it. The air near the ceiling of a living room is more foul than the air near the floor, for breathing warms the air and causes it to rise. If an opening is made in the ceiling or near it, warm foul air will flow through this out of the room; but if an opening is near the floor, cool air will usually flow into the room.

It is easy to ventilate a heated room by dropping the upper sash of a window. Warm, foul air will flow out above the sash, and its place will be taken

by cooler air which enters the room through cracks in the floors, windows, and doors. The streams of fresh air will be small and will spread through the room without causing drafts.

Another way to ventilate a room is to raise the lower sash of a window. When this is done, the direction of the stream of air will usually be into the room, and drafts will sometimes be formed. The drafts may be prevented by covering the opening with a sheet of thin muslin. The cloth will allow air to pass through it, but will prevent the wind from blowing through it in a draft. It may be tacked to a frame and set in the window like a fly screen.

Ventilating Cold Rooms. — Many persons think that there is not so much need of ventilating their rooms in winter as in summer, because foul air does not smell so bad when it is cold as when it is warm. The air of a cold room will usually become impure as quickly as the air of a heated room, but the smell of bad air in a warm room is more unpleasant than in a cold room. Ventilate your room whether it is warmed or not.

Night Air. — Many persons sleep with the doors and windows of their bedrooms closed because they think that the outdoor air is harmful at night. Do not be afraid of the night air. It is usually purer than the air during the day, for but little dust is stirred up during the quiet hours of the night. Keep your bedroom window open at night.

Ventilating Bedrooms. — Some persons clean their bedrooms and air them every morning and then close them up until the next morning, thinking that the fresh air will last all through the night. If you sleep in a bedroom which is not ventilated, the air in it will become impure in an hour after you go to bed, and you will breathe foul air all the rest of the night. An odor of foul air in a bedroom in the morning shows that the air has been bad during the night.

You cannot get ventilation enough by leaving your bedroom door open, for that lets in air from only another part of the house. You need fresh air from outdoors. Sleep with a window of your bedroom open, and if the room is cold, keep yourself warm by using thick bed covers.

A Sleeping Porch

It is healthful to sleep out of doors if one is wrapped up warm.

Sleeping Outdoors. — The best way to make sure of breathing pure, fresh air all night long is to sleep outdoors. A person is no more likely to

catch cold by sleeping out of doors than by taking a ride. Many weak persons sleep on porches for the sake of their lungs. They cover up warmly and wear hoods on their heads, and in the morning they wake up bright and refreshed.

QUESTIONS

1. What are some of the causes of the impure air in rooms?
2. How does a lighted lamp make the air of a room impure?
3. What harm does impure air do to a person?
4. What are some of the diseases that may be caught from foul air?
5. How may impure air be distinguished from pure air?
6. How may the air in a room be kept pure?
7. What is ventilation?
8. How may a room be ventilated without a draft?
9. How would you use a screen of muslin to prevent a draft?
10. Why do cold rooms need as much ventilation as warm rooms?
11. Why should a person sleep with his bedroom window open?
12. Why is it well for persons having weak lungs to sleep in the open air?

For the Teacher. — Do not go too deeply into the reasons for the depressing effects of foul air, for the explanation is too complicated for a pupil to follow. The explanation also involves the subject of the regulation of the heat of the body. Teach how to detect foul air, and how to ventilate by means of open windows.

Teach the subject of ventilation largely by the example of daily and hourly attention to the windows and the heating system of the schoolroom.

CHAPTER XXII

BODY HEAT

The Warmth of the Body. — The body warms itself by the slow burning or oxidation that is always going on within it (p. 169). The body produces about as much heat as two burning candles. Some parts of the body make more heat than other parts. The muscles and the liver make more heat than the bones and the skin. Yet all parts of the body are nearly equal in warmth, for the blood stream warms them as it passes through the flesh like hot water through a radiator in a house.

TWO BURNING CANDLES

They produce about as much heat as the body of a grown man who is doing light work.

The Skin and Warmth. — The feeling of warmth is mostly in the skin. If your skin is red with blood, it will be warm and you will feel warm all over. If your skin is pale and contains only a little blood, it

will be cold and you will feel cold all over, even if the inside of your body is too warm. If you feel cold or chilly, you may become warm by doing something that will force the blood through the skin, such as taking exercise, or rubbing the skin. You do not mind cold weather if a good supply of blood flows through the skin.

A Snowy Day

You will not mind the cold if you wear enough clothing to keep all parts of your body warm and dry.

Clothing. — Clothes do not produce heat, but they keep the body warm by preventing the loss of the heat which the body produces. You cannot become hardened to cold weather by wearing thin clothes, or going without a cap, or warm shoes, or mittens, and then trying to stand the pain of a cold skin. If you do this, you will weaken your body.

You will not become used to cold if you wrap yourself up in very thick clothes, for the skin will not have a chance to touch the cold air. But if you exercise or work hard in the cold air, the warm blood will flow through the skin and you will keep yourself warm without needing to bundle up with thick clothes.

How the Body Is Cooled. — The body is always producing heat, and would soon become too warm if it did not lose heat. It is cooled by the air and by the perspiration.

The air is nearly always cooler than the body, and so cools the skin by its touch. The body loses heat rapidly on a cold day, and thick clothes may then be needed to prevent the loss of too much heat.

If the day is very warm, the air alone may not take heat from the skin fast enough to keep the body cool. The skin then produces an extra amount of perspiration, which cools the body in the same way that a sprinkling with water would cool it. A person is not likely to become overheated on a hot day if he perspires freely.

Sunstroke. — If the stomach, or lungs, or skin, or other part of the body is out of order, the perspiration may not be formed freely, even when the day is hot. The heat will then remain in the body and will cause faintness and weakness. If a person is made sick by heat, we say that he has a *sunstroke.*

If you feel faint from the heat, lie down in a cool spot, and cool the head by bathing it with cold water.

Cold Hands and Feet. — If the hands or feet are cold, wrapping them up may not always make them warm, for the covering neither makes heat, nor causes blood to flow through the cold part. But you can warm any part of the body by doing something which will make a great deal of blood flow through it. If the ears are cold, you can warm them by rubbing them briskly. You can warm your hands by clapping them together, or by whipping your arms hard around your back. You can warm your feet by stamping them on the ground. In these ways you will make the warm blood flow through the cold part.

WARMING THE HANDS

You can warm your hands quickly by swinging them and whipping them hard around your shoulders.

Frozen Parts. — When a finger, or toe, or ear is frozen, it will usually get well if it is thawed very slowly. Do not take a person who has a frozen part into a warm room, but keep him in a room where the air is cold. Then warm the room slowly. Put the frozen part in cold water and let it thaw slowly while the water grows warmer with the room. Another good way to thaw a frozen part is to rub it with snow.

Heating Houses. — The temperature of the body of a healthy person is about 98½° F. When the air is as warm as the body, a person feels extremely warm and uncomfortable, for the air cannot take the heat away from the body. The body feels most comfortable when the temperature of the air of a room is about 70° F. If the temperature of the air of a room is less than 60° F., the room will feel too cold for comfort.

Pure Air and Heating Houses. — Many persons forget about the purity of the air when they heat their houses. They close their windows to keep the warm air in the room and the cold air out. Then the air soon becomes foul and unfit for breathing. A heated room needs ventilation (p. 184).

A fireplace will ventilate a room as well as heat it, for the fire will cause a large stream of air to flow from the room up the chimney. A stove in a room will not help the ventilation much, for its drafts will take only a small quantity of air from the room.

There are three ways of carrying heat from a cellar furnace through a house: (1) by means of hot water; (2) by means of steam; and (3) by means of hot air. Neither hot water nor steam used to heat a room will ventilate it, for neither will cause air to flow either into the room or out of it. Hot-air heaters take fresh air from out of doors, heat it, and send it to the rooms; and so they ventilate houses while they heat them.

Moisture in the Air. — If air contains all the vapor of water that it can hold, we say that it is moist. If

it contains only one third or one half as much water as it can hold, we say that it is dry. Warm air can hold a great deal more water than cold air. Moist air that is freezing cold becomes dry air when it is warmed to a comfortable temperature. For this reason the air in heated houses is often too dry for health.

When you warm a room, keep a pan of water in the furnace, or on the register, radiator, or stove, in order that its vapor may make the air moist.

Oil and Gas Stoves. — Most stoves which burn oil or gas have no pipes running to the chimney, and so they pour harmful gases into the room. They are not safe unless the room is kept well ventilated. They can be made safe by being fitted with pipes which will carry the gases up the chimney.

Gas Poisoning. — Coal stoves sometimes give off a poisonous gas. When it is breathed, it unites with the red blood cells and keeps them from taking oxygen from the air. This gas is also found in the illuminating gas which is burned for lighting houses, and is sometimes formed by stoves which burn oil or charcoal. It can usually be recognized by an unpleasant smell. Air with the least smell of the gas is dangerous.

Effects of Alcohol on the Heat of the Body. — An excuse that is sometimes given for taking strong drink is that it seems to make the drinker feel warm. It does this because it causes a great deal of blood to flow through the skin; but it really makes a person cold because it brings the blood to the surface of the

body where it loses its heat. A person is able to stand the cold better when he lets strong drink alone.

QUESTIONS

What warms the body?

How are all parts of the body kept equally warm?

How does exercise help the body to endure cold?

In what part of the body is the greatest feeling of heat and cold?

What effect does the perspiration have upon the heat of the body?

Why does a person not get overheated when he is perspiring a great deal?

What should be done for a person who has a sunstroke?

If your hands are cold when you are far away from a fire, how may you warm them?

How should you care for a frozen part of the body?

What degree of heat is the most comfortable in a living room?

Why should moisture be added to the air of a heated room?

How can you make the air of a heated room moist?

What effect may a burning oil stove or gas stove have upon the air in a house?

What is the danger from the gas from a coal stove, or a leaking gas jet?

What effect does alcohol have upon the heat of the body?

For the Teacher. — Compare the production of heat and its distribution through the body with a hot-water system of heating a house. The comparison explains why clapping the hands together warms them. Refer to the subject of clothing, in Chapter V.

Teach that the feelings are the best guide in judging the amount of clothing needed; but that one must think ahead and prepare for changes in the weather and in one's occupation.

Teach the use of the perspiration in cooling the body; and that sunstroke will not occur as long as one perspires freely.

Teach the subject of proper warmth in a room by watching the thermometer and regulating the warmth by attention to the heating and ventilating systems.

Teach the pupils to read a thermometer, and to know the meaning of the various degrees of freezing, proper room warmth, body temperature, a fever, and boiling.

CHAPTER XXIII

COLDS

Infectious Diseases. — The most common kinds of sickness among children and young persons are those infectious diseases which are usually called *colds* and *fevers*. They are caused by living disease germs; are caught from other persons; and are spread principally by means of the waste substances from the bodies of the sick (p. 18).

Fever. — When disease germs grow in the flesh, they usually make the body too warm. The natural temperature of the body is about 98½° F. A temperature of the body which is warmer than 98½° F. is called a *fever*. It is a sign of sickness, for it is usually caused by disease germs growing in the body. A person whose temperature is warmer than 101° F. will usually feel too sick to work. If the temperature is warmer than 103° F., the person will be too sick to sit up, and with a temperature of 104° F. he will be dangerously sick.

Signs of an Infectious Disease. — A list of common infectious diseases is given on pages 14 and 15. A person who is beginning to have one of these diseases will usually feel weak and sick, and will not want to

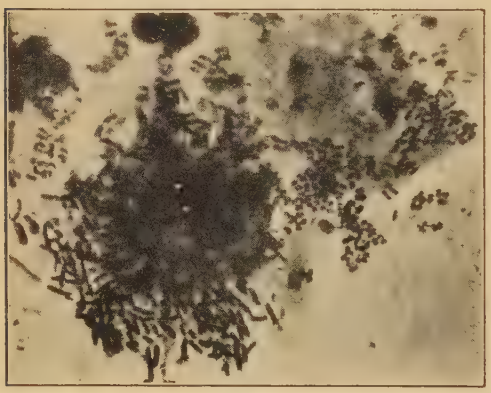
eat. He will have pains in his head and back, and his tongue will be dry and coated. If a person has these feelings, one of the first things to do is to take his temperature. If he has a fever, he probably has an infectious disease, and needs to do two things:

1. To take care of himself so that he may get well quickly.
2. To try to keep from spreading his disease to others.

What a Cold Is. — If a person is mildly sick and has little or no fever, his sickness is often called a *cold*. There is a common form of infectious sickness, called a *common cold*, or a *cold in the head*, in which the nose is sore and there is sneezing and coughing. This disease is nearly always mild, and yet a person who has it feels as he would if he were coming down with a disease which is dangerous to life, such as influenza, pneumonia, measles, scarlet fever, or typhoid fever. What is called a common cold may be a mild form of a dangerous disease. Many persons who are beginning to have pneumonia or other dangerous diseases do not take care of themselves, because they suppose they have only common colds and will soon get well. Those who do not take care of their common colds not only endanger their own lives, but they may spread dangerous diseases to many other persons.

Cause of a Cold. — A cold is caught from other persons who have colds, just as measles is caught from some

one who has measles. Many persons suppose that the principal causes of taking cold are cold and dampness, for they often have colds after they have been sitting in a cold wind or after their clothes have been wet. One reason why dampness and cold air tend to bring on colds is that many people close their doors and windows during bad weather, and then stay in rooms where the air is foul and contains disease germs. Few persons have colds in summer because then they usually keep their living rooms and houses open and well ventilated.



THE DISEASE GERMS OF A COLD

(Magnified 1000 times.) They were in the mucus that was blown from the nose of a person who had a bad cold.

Another reason why cold air and dampness help to bring on colds is that they weaken the body, and then the white blood cells are not able to destroy disease germs easily (p. 137). But the white blood cells are often weakened by many other things besides cold and dampness. They are weakened by wrong eating, by overwork, and by loss of sleep more often than they are harmed by cold and dampness. Colds are common

among those who stay indoors and do not become cold and wet at all.

Weakening the body and the white blood cells will not cause a cold if disease germs do not enter the body. The men who were with Admiral Peary and other Arctic explorers were often wet, and cold, and overworked, and yet they were free from colds while they were in Arctic lands, because in those places they did not meet any one who had a cold or other sickness. Yet the same explorers began to have colds as soon as they reached a town on their way home, because then they took disease germs from other persons.

Drafts and Colds. — The wind blowing on the body out of doors seldom causes a sickness, because the outdoor air is almost free from disease germs. A draft of cold outdoor air, blowing across a room which is full of warm, foul air, may injure a person's body slightly, and so may prevent it from killing the disease germs which enter the lungs from the foul air. But if the air of a room is pure and free from disease germs, a draft of cold air blowing across it will not harm the body more than the wind out of doors would harm it. Many persons fail to ventilate their rooms because they are afraid that a draft will make them catch cold. Foul, impure air in a room is many times more dangerous than a draft of pure air in it.

How Disease Germs Are Spread. — Those who have colds give off disease germs with everything which comes from their noses and throats. The germs are found in

tiny drops of saliva and mucus which are blown from the nose and mouth during coughing, sneezing, loud talking, and laughing. Hold a cold mirror in front of your mouth while you cough. A spray of small drops of saliva and mucus will be blown from the mouth, and will fall on the glass where you can see them easily. These drops will contain disease germs if you have a cold.

Coughing and sneezing spread colds and other infectious diseases. A person who coughs or sneezes near you is likely to blow disease germs into the air which you breathe. It is a good rule that a pupil who coughs and sneezes shall be sent home from school. Some states and cities have laws that all persons shall cover their noses and mouths when they sneeze in public places.

SNEEZING AND COUGHING SPREAD DISEASES

Hold a handkerchief to your nose and mouth when you cough or sneeze.

Infectious diseases are spread by means of air which is dusty and foul. Disease germs which are coughed, or sneezed, or spit out from the body may float in the air as dust, and may be taken into the bodies of those who breathe the air. Spitting on the floor may spread diseases, for when the mucus is dried, its disease germs rise with the dust of the room. Good ventilation and

cleanliness of rooms and floors are necessary in order to keep colds from spreading.

Soiled dishes and toilet articles spread diseases. If a person has a cold, disease germs will be found on everything that is soiled with mucus from his nose and mouth. They will be on his handkerchiefs and towels; on his dishes, napkins, and drinking cups; on his bedclothes; and on pencils which he touches to his mouth. Cleanliness of all these things is necessary in order to keep colds and other diseases from spreading.

Keeping Colds from Spreading. — If you have a cold, you have caught it from some one else who has a cold; and you may give it to another person unless you take care to keep it from spreading. There are two things to do in order to prevent the spread of a cold which you may have:

1. *Keep Away from Other Persons.* Stay away from school and parties, and from other places where crowds meet. Stay at home if you can; but keep so far away from others that you do not cough, or sneeze, or laugh, or talk loud into their faces. Five feet is usually a safe distance.

2. *Catch and Destroy All the Mucus and Other Matter That Comes from Your Nose and Mouth.* Have handkerchiefs, towels, and dishes for your own use; and do not let any one else use them until they have been well washed. Do not handle anything that may be used by other persons. Do not spit on the floor or pavement. Use a handkerchief when you blow your

nose or clear your throat (p. 54). Hold a handkerchief to your nose and mouth when you cough or sneeze. Take a clean handkerchief as soon as one is soiled.

What to Do for a Cold. — A cold will last as long as its living germs grow in the body, and will end when the disease germs stop growing. Medicines will not kill the disease germs, or keep them from growing. Medicines which stop a cough often do harm, for the object of the cough is to remove mucus and disease germs from the body. There are four simple things for a person who has a cold to do:

1. Rest, in order that the body may use all its strength in overcoming the disease germs and their poisons.

2. Keep the sick room clean and ventilate it, in order that no disease germs may remain in it.

3. Keep the nose and throat and all the rest of the body clean, in order to get rid of as many disease germs as possible.

4. Eat little food, but drink plenty of water in order that the kidneys and other organs may remove the poisons of the sickness rapidly.

How to Avoid Taking Cold. — If you are well, there are two principal things to do in order to avoid taking cold:

1. Keep the germs of colds out of your body. Keep the nose and mouth clean. Have everything clean

which touches the nose and mouth. Breathe air which is pure, and keep away from those who have colds, and from places in which the air is foul and dusty.

2. Do those things which will help to make the body strong and healthy, in order that it may destroy the disease germs which enter it. Eat properly, take proper exercise, and keep the body comfortably warm.

Disease of the Lungs. — Pneumonia is a name which is given to any disease in which the disease germs grow in the lungs and cause the air sacs to become filled with solid or liquid matter. Nearly all forms of pneumonia are infectious, and may be spread from the sick to other persons by means of the mucus coughed up from the lungs. Many colds are caused by the same kind of germs which would produce pneumonia if they should reach the lungs.

Influenza, or grippe, usually begins like a common cold, and a person who has it may spread it to others before he becomes sick enough to stop work. A great epidemic of influenza spread over almost all the world in 1918 and 1919, and caused more deaths than any other known epidemic in history. If every person who had influenza had been sick abed from the beginning of his sickness, the disease would not have spread. But many persons who had the disease mildly went among others while they sneezed, and coughed, and spread their germs to others. Influenza shows the need of taking care to prevent the spread of every disease which looks like a cold.

QUESTIONS

1. What is an *infectious* disease?
2. Name some common infectious diseases.
3. What are some of the signs of an infectious disease?
4. What is the cause of fever?
5. How can you tell that a person has fever?
6. What is a *common cold?* What is its cause?
7. Name some dangerous diseases which may seem like a common cold when they begin.
8. What have cold air and dampness to do with catching cold?
9. How do the germs of a cold leave the body?
10. How may sneezing and coughing spread a cold?
11. How may soiled towels and handkerchiefs spread colds?
12. Give some rules for preventing colds from spreading.
13. How should a person use a handkerchief in preventing the spread of a cold which he may have?
14. If you had a cold, what should you do for it?
15. How can you keep yourself from catching cold?
16. What is *pneumonia? influenza?*

For the Teacher. — Teach the subject of infectious diseases from the standpoint of the seed, rather than from that of the soil — as follows:

1. Immunity of the soil — the body — to the growth of disease germs which enter it comes principally from previous vaccination or attacks of disease; and secondarily, from vigor and strength of the body.

2. If seeds or germs of disease become planted in the body of any person, they are likely to grow and produce a cold or a fever, even if that person is strong and vigorous.

3. The principal means of defense against most disease germs consists in preventing the germs from entering the body.

4. A cold is a name loosely given to nearly every kind of infectious disease, if the sickness is mild.

5. Drafts, coldness, dampness, and fatigue help to bring on colds and other infectious diseases by preparing the "soil" for the disease germs.

6. A person with a cold or other infectious disease is likely to spread it to others. Teach pupils to keep away from others when they have a cold or fever.

7. The most impressive teaching consists in inspecting and questioning every child who appears to be sick, and in sending it home if it has signs of a cold or fever. This is the duty of the school nurse and physician.

CHAPTER XXIV

SOME COMMON FEVERS

Children's Diseases. — Measles, German measles, chicken pox, and whooping cough are infectious fevers which children often have before they are grown. Very few persons can take any of these diseases a second time. Many persons let their little children take them so that they will be free from them during the rest of their lives. This might be proper if the diseases were always mild and harmless. But they are often dangerous, and thousands of deaths are caused by them each year in the United States. Those who have them are likely to catch diseases of the lungs, such as bronchitis (brŏng-kī′tĭs) and pneumonia. Nearly all this danger and suffering could be prevented if everybody would try to keep the diseases from spreading.

Measles. — Measles is a fever which many persons think is a mild, harmless disease; but it often causes pneumonia and ear diseases, such as earache, running ears, and deafness. Measles can be known by the red spots which appear on the skin of the sick person. But when the spots can be seen, the disease is half over. The sickness of measles has two stages. Its first stage is like a cold in the head, which lasts about five days before the spots appear, and during all that time a

fever is present. The second stage begins when the spots break out, and is often the only stage in which anything is done to prevent the spread of the disease.

Measles is spread in the same way that colds are spread (p. 100). The disease at first is often supposed to be only a common cold, and a child in the first stage often goes among other children, sneezing and coughing and blowing mucus into their faces, and spreading disease germs among them before the real nature of the sickness is known. Measles is usually caught from other children while they seem to have only a cold.

Boards of Health. — Many persons do not know how to prevent the spread of measles and other infectious diseases, and many others do not try to do so because they are careless. Nearly every state, city, and town has a board of health whose duty it is to compel all persons to help in preventing infectious diseases. Many boards of health employ doctors and nurses to visit the homes of the sick and to teach the people about measles and other diseases, and how to prevent them from spreading.

Reporting Measles. — If a board of health would prevent the spread of measles, it must know who has the disease. It is the rule of a board of health that doctors, teachers, and parents shall report the names and addresses of every person who has measles, and who is in their care. One reason why the spread of measles is not stopped is that many persons do not know the meaning and the danger of a cold; and so

they do not report measles until the red spots cover the body and the sick person has already spread the disease to others. The report has the most value when it is made as soon as the sick person begins to show signs of the first stage of the disease.

Quarantine, or Isolation. — When a case of measles is reported, a doctor or nurse from the board of health visits the sick person and tells the parents or nurse about the rules for preventing the disease from spreading. Many states and cities have printed pamphlets which describe measles and other diseases and give the rules for their prevention. Ask your board of health for a copy of the one on measles.

The first rule is that the sick person shall be placed in a room apart from the rest of the family. Keeping a sick person away from others who have not had the disease is called *quarantine* (kwŏr′an-tēn), or *isolation* (ī-sŏ-lā′shun). The doctor or nurse will place a sign on the house stating that a sick person is quarantined, or isolated, there, and forbidding visitors to go into the house.

Disinfection. — The second rule of the board of health is that disease germs which come from the sick person shall be caught and destroyed. The germs are found in the mucus and saliva and other substances that come from the nose and mouth of the sick person. If these substances are destroyed, as described on page 201, disease germs are not likely to escape from the sick room.

Destroying disease germs in a substance is called *disinfec'tion*. Cleanliness is the best method of disinfection, for bathing, washing, and scrubbing remove and destroy disease germs, besides removing dirt. Substances, called *disinfectants*, that will kill disease germs are often added to the wash water. Some common disinfectants are carbolic acid, for'malin, and chloride of lime.

Contacts. — Those who have caught measles will come down with the disease within two weeks after they have taken the germs into their bodies. One who has been with a person having an infectious disease is called a *contact*. It is a rule of boards of health that contacts who have not had measles shall be watched for two weeks and shall be isolated at the first sign of sickness. The object of this rule is to find new cases as soon as they begin to be sick and before they spread the disease to others.

Sore Throat. — There are four common infectious diseases in which the throat is sore:

1. A common cold.
2. Tonsillitis.
3. Diphtheria.
4. Scarlet fever.

Diphtheria. — Diphtheria is one of the most dangerous forms of sore throat. It is also one of the most common of severe diseases. It is caused by diphtheria germs which grow on the tonsils and back part of the

throat, and produce a thick, white coating on the parts. The germs also produce a dangerous poison which goes through the body with the blood, and may cause death.

Whenever a person has a sore throat, diphtheria is a disease to think about. It may be recognized in two ways:

1. By seeing the coating in the throat.
2. By finding the diphtheria germs.

Examining the Throat. — Many children have died from diphtheria and other throat troubles because they were afraid to let any one look into their throats in order to see what disease they had. When a doctor examines your throat, open your mouth wide and let him press your tongue down so that he can look into the back part of your throat.

EXAMINING THE THROAT

The tongue must usually be pressed down in order to let the tonsils and back part of the throat be seen. This may be done with a clean spoon handle.

Cultures. — A doctor who examines your throat will rub a small swab of cotton over your tonsils in order to pick up any disease germs which may be there. He will then plant the germs in a glass tube on

A Culture Tube

The tube contains a substance on which disease germs can grow. A doctor rubs the swab over a diseased part (throat) and then over the substance in the tube. The disease germs grow in the tube and multiply until they can be easily seen.

a substance on which they will grow readily. If diphtheria germs are in the throat, they will grow in the tube and multiply to great numbers in a few hours. They may then be easily seen with a microscope. A tube of growing germs is called a *culture*. The rule is that a culture shall be made from germs taken from the throat of every person who has spots or a coating on his tonsils or in his throat. Boards of health support laboratories in which the cultures will be examined free.

Antitoxin. — If a substance called *diphtheria antitox'in* is given to a person who has diphtheria, it will overcome the poisons of the diphtheria germs which have been in his body. If it is given to a well person, it will prevent diphtheria germs from growing, if any should enter his body. It is so valuable in cur-

ing and preventing diphtheria that many states and cities supply it free.

Rules for Preventing Diphtheria. — Boards of health have rules that all cases of diphtheria shall be reported, and that strict quarantine, or isolation, and disinfection shall be carried out, as in measles (p. 207).

Diphtheria Carriers. — Germs of diphtheria sometimes continue to grow in the nose and throat for weeks after the sick person has become well. A well person who has the germs of diphtheria growing in his body is called a *carrier*, and can spread the disease as readily as one who is sick. Most persons who have diphtheria catch the disease from carriers. The rule of most boards of health is that a diphtheria carrier shall be isolated as long as cultures from his throat show diphtheria germs.

The germs in a carrier usually grow very near the surface of an unhealthy part, such as an enlarged tonsil. The best way to get rid of the germs in a carrier is to remove the tonsils or to heal the unhealthy part.

Scarlet Fever. — Scarlet fever usually begins with sore throat, vomiting, and a fever. In a few hours the skin becomes covered with fine red spots, and at the end of the sickness the skin peels off in coarse scales and flakes. The disease is as dangerous as diphtheria, and its germs spread in the same way. Boards of health, therefore, have rules that cases of this disease shall be reported, and quarantined, or isolated in the same way as those of diphtheria.

Whooping Cough. — Whooping cough is an infectious disease in which the sick person has spells of coughing until he is out of breath. He then takes a breath suddenly and with a whooping noise. The disease is sometimes dangerous to life, but it is often so mild that it seems like a common cold. If a child has spells of coughing, and also other signs of a cold, whooping cough is to be suspected. Boards of health have rules that cases of whooping cough shall be reported and isolated like those of measles.

Diseases of the Intestine. — Most forms of stomach ache and diarrhœa are caused by disease germs which grow in the intestine. They are often spread by food which has been handled by diseased persons, and by water which contains sewage. Their germs are found in the discharges which pass from the intestines and kidneys of the sick. If a small quantity of these discharges is swallowed with food and drink, they may cause the disease. Three common means of spreading these discharges to food and water are:

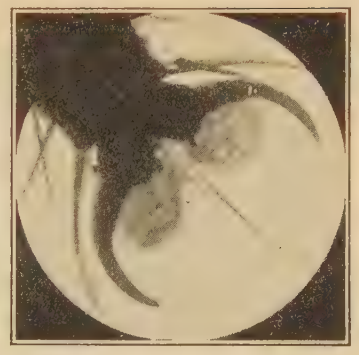
1. The dirty hands of careless persons (p. 105).
2. Sewage (p. 116).
3. House flies.

Insects and Diseases. — Several infectious fevers are spread by insects. Two common insects which often spread diseases are house flies and mosquitoes.

House Flies. — House flies crawl over slops, sewage, and garbage heaps. There they pick up disease germs

THE UNDERSIDE OF A HOUSE FLY

(Magnified 5 times.) A house fly is covered with coarse hairs which catch hold of dirt and disease germs.



FOOT OF A HOUSE FLY

(Magnified 200 times.) A fly cannot clean the dirt from its rough feet and legs.

on their feet and bodies. The flies then come into kitchens and leave the germs on dishes and food. Typhoid fever, tuberculosis, and diphtheria are some of the diseases which may be spread by house flies. One reason why fewer persons have stomach ache and typhoid fever in winter than in summer is that there are very few flies in dwelling houses in winter.

A great deal of sickness and a great number of deaths may be prevented by putting fly screens in doors and windows so as to keep flies out of houses and away from food. It would be a great deal better to get rid of all house flies.

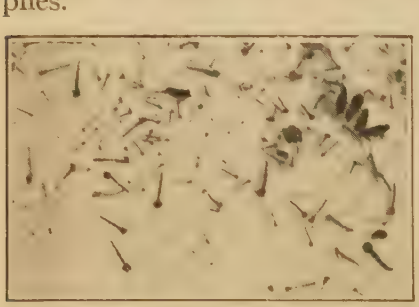
How to Get Rid of Flies. — House flies hatch from eggs which are laid in manure piles, garbage heaps, and other collections of decaying substances. The young flies look like worms and are called *maggots*. Each

maggot is a young fly. It takes about two weeks for an egg to become a full-grown fly. No flies could grow

THE FOUR STAGES IN THE LIFE OF A FLY

A fly lays eggs from which maggots hatch; the maggots turn to pupæ from which full-grown flies come.

if all manure piles and garbage heaps were cleaned up at least once a week. There would soon be very few house flies left if all persons who keep cows and horses should take care of their stables, yards, and manure piles.



MOSQUITO EGGS AND WIGGLERS

(Natural size.) Compare with the illustration following

Malaria and Mosquitoes. — Malaria is one of the most common of all infectious diseases in some parts of the world. It is caused by disease germs which grow in the red blood cells of a sick person. The

germs are carried from the sick to other persons by mosquitoes. Not all kinds of mosquitoes can carry the germs, but the kinds which do carry them are often found with the harmless ones. Yellow fever is another disease which is spread by mosquitoes. The boards of health of many places, such as Panama, have entirely prevented malaria and yellow fever by getting rid of mosquitoes.

MOSQUITO, EGGS, AND WIGGLER
(Magnified 5 times.)

A mosquito lays eggs on water; wigglers hatch from the eggs and live in the water, and finally turn into winged mosquitoes.

A DITCH IN WHICH MILLIONS OF MOSQUITOES HATCHED AND GREW

Mosquitoes hatch from eggs which are laid in stagnant water. The young are called *wigglers*. In summer they may often be seen tumbling about in rain barrels. One way to get rid of mosquitoes is to empty out all

rain barrels and other collections of dirty water, and to drain marshes and pools, so that there will be no places in which the young insects may grow. Another way is to cover the water with a little kerosene or other thin oil in order to kill the wigglers.

QUESTIONS

1 What is the danger from whooping cough, measles, and other mild children's diseases?

2 When a person begins to come down with measles, what are the first signs of the disease?

3 When is a child who has measles most likely to spread the disease?

4 If you had measles, what rules would the board of health make you follow?

5 What is *quarantine? isolation?*

6 What is *disinfection?*

7 If you had measles, how could you destroy the disease germs which leave your body?

8 What is a measles *contact?*

9 If you had never had measles, but had played with a child who has the disease, what rule would the board of health make you follow?

10 Of what four common infectious diseases is sore throat a sign?

11 What is *diphtheria?*

12 What can usually be seen in the throat of a person who has diphtheria?

13 What is a *culture?* When should a throat culture be taken?

14 Of what use is diphtheria *antitoxin?*

15 What is a diphtheria *carrier?*

16 What are the signs of scarlet fever? of whooping cough?

17 What are some of the common causes of stomach ache and diarrhœa?

18 How do house flies spread diseases?

19 Where are house flies hatched?

20 What do young house flies look like?

21 How can people get rid of house flies?

What diseases do mosquitoes spread?
Where do young mosquitoes live? What do they look like?
How can people get rid of mosquitoes?

For the Teacher. — This chapter deals with some common diseases which illustrate the fundamental principles in the control of infectious diseases. The principles to be emphasized are as follows:

1. Reporting diseases to the health officer, or board of health.
2. Isolation, or keeping the sick apart and away from the well.
3. Contacts and their control. Most contacts may be discovered, and if they are controlled, they will not spread a disease while they are coming down with it.
4. Examination of the throat. Many common diseases may be discovered early if the throat is examined. Teach the pupils to allow their throats to be examined, and to permit a tongue depressor to be used. Take a clean one for each pupil.
5. Cultures, and how to take them and what they are likely to show.
6. Antitoxin and its value in diphtheria, both for cure and for prevention.
7. Carriers, what they are and how they are dangerous.
8. Diarrhœas and their infectiousness, and their spread by sick persons who, after going to the toilet, do not wash their hands.
9. Flies and mosquitoes and their relation to diseases.

These several topics cannot be taught to young pupils in one lesson. They may be taught most effectively by using known cases of sick pupils, when their diseases develop. The classroom teaching will supplement the work of the school nurse and doctor.

CHAPTER XXV

EXERCISE

Muscles. — The motions of the body are made by means of *muscles*. An animal's muscles are its lean meat. Most of the flesh of a person's body is muscle that looks like the lean meat of an animal. Over half of a man's body is composed of muscle.

Each muscle is made of cells, or tiny strings of flesh, which are reddish in color. The cells are bound into bundles by a small quantity of *connective tissue* (tish'ū), which is white. Red bundles of muscle cells and white threads of connective tissue may be easily seen with the naked eye on a piece of beefsteak. The separate cells and threads cannot be seen without a microscope.

MUSCLES AND TENDONS OF A CAT'S LEG
A muscle pulling on the tendons bends the toes.

Muscle cells in meat are soft and tender, but connective tissue threads are firm and tough. If meat contains a great deal of connective tissue, it will be tough.

The muscles of the arms and legs are large at their

upper ends and taper toward their lower parts, where they end in white cords. The cords are like smooth strings and are composed of connective tissue. Some of them are as large as lead pencils and are as strong as though they were made of silk. They are fastened to the parts of the body that are to be moved.

Cords may easily be felt on the front of the wrist and also on the back of the knee when the leg is bent. Another name for cords is *tendons*.

Most of the muscles of the face are in the form of flat sheets and have no cords fast to them. Nearly all of them are fastened to the lips and cheeks, or to the skin around the eyes. They change the appearance of the face in laughing and crying.

FACE MUSCLES IN ACTION

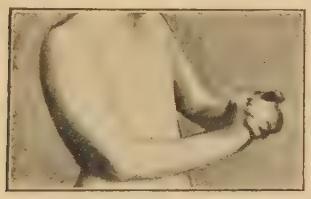
The muscles of the face move the lips and eyelids and pucker the skin of the face in laughing and crying.

How a Muscle Acts. — When a muscle acts, it swells out its middle part and shortens itself and thus it pulls upon its cord and moves whatever is fastened to the cord.

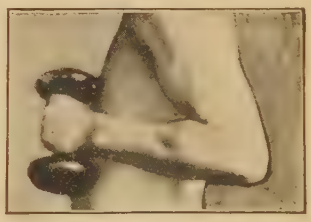
Grasp your arm above the elbow, and bend the arm as far and as strongly as you can. The muscle which bends the elbow will now feel hard and swollen.

Let the arm drop to your side. The muscle will now feel soft and flat.

Muscles that are used in a proper way grow large and strong. Athletes practice for hours each day in order to increase the size and strength of their muscles.



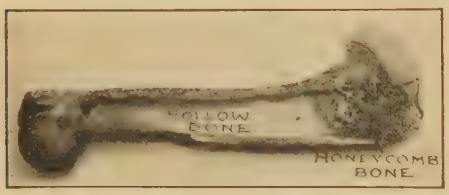
Arm Muscles of the Right Arm at Rest



Arm Muscles in Action

When a muscle acts, it swells and becomes hard.

Bone. — Muscles are built upon a framework of bone. The principal use of bones is to support the soft flesh, just as beams support a house. Most bones lie inside of bundles of muscles. If the bone of an arm or leg is broken in two, the limb will be useless, for there will be nothing to support the soft flesh. A doctor will bring the broken ends into place, and will bind the whole bone to a stiff board or *splint*, to keep the parts from moving. Then a new piece of bone will form, and unite the broken ends. This takes from three to six weeks (p. 155).



A Long Bone Sawed in Two Lengthwise

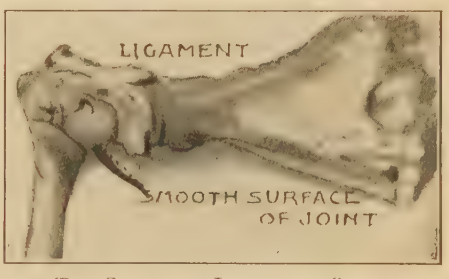
Its central part is hollow, and its ends are spongy.

The lime which is in bones makes them stiff. The

bones of grown persons contain a great deal of lime, and will not bend much without breaking. The bones of babies and young children will bend somewhat without breaking, for they contain less lime than the bones of grown persons. For this reason the bones of children are not injured by falls and blows which would break those of older persons.

There are about 200 bones in the body, and each has a name. For example, the bone of the upper arm is called the *hu'merus*, the bone on the thumb side of the forearm is called the *ra'dius*, and that on the little finger side is called the *ul'na*.

Joints.—Bones are joined together end to end with thick and strong bands of gristle called *lig'aments*. Nearly all of the bones of the arms and legs may be turned on their joints, like doors on their hinges. The ends of these bones are smooth and round, and are made slippery by a fluid.



THE SHOULDER JOINT OF A SHEEP

One side is cut open to show the rounded upper end of the leg bone.

Most of the motions of the body are the bending of joints by means of muscles. One end of a muscle is usually fast to a bone, and the other end, or its cord, is fastened to the bone next to it. When the muscle shortens itself, the two bones turn at the joint.

Sprains. — When a joint is bent too far, its ligaments will be stretched and torn. Then the joint is said to be *sprained*. A sprained joint is painful and swollen, and the skin around it is often black or blue because of the bleeding from the torn ligaments.

What to Do for a Sprain. — If a joint is sprained, put it into a pail of hot water for an hour or two. Add more hot water every few minutes to keep the heat as great as can be borne. This will lessen the pain and swelling. Afterward wrap a bandage snugly around the sprained part, and for some distance on each side of it, in order to keep the joint from moving. But after a day or two use the sprained part in order to keep the joint limber.

Two Objects of Exercise. — The use of muscles is called *exercise*. One reason for taking exercise is to have large and strong muscles. It is a fine thing to be large and strong in body, but in these days great muscular strength is not often needed. Healthy muscles are of more value than strong ones, but muscles will not be healthy unless they are exercised.

A second reason for taking exercise is to keep well in both body and mind. No one can feel well and bright without some exercise. Girls and women need exercise as much as growing boys do.

Exercise and Health. — Muscles get their power from the burning or oxidation of food, just as an automobile gets its power from burning gasoline. Exercise produces hunger, because the muscles oxidize food

rapidly while they work. It causes shortness of breath and deep breathing, because the working muscles require a great deal of oxygen. It rouses every part of the body to do its best work. It causes the stomach to prepare food, the lungs to supply oxygen, the heart to pump blood, and the kidneys and skin to get rid of waste matter. When your muscles are in good condition, you are likely to be well and strong in body, and bright and cheerful in mind.

An Erect Body. — When you hold up your head and shoulders, you exercise the muscles of your back. Then the muscles grow strong and hold up your shoulders without your thinking about them. Soldiers are taught to stand straight in order that their muscles will grow strong and their lungs will have great breathing power (p. 175). Always standing straight and sitting upright will help you as much as these positions will help a soldier.

How Much to Exercise. — The most healthful way to live is to stay out of doors all day doing light work with the hands. Those who sit still and work for hours with their minds will not feel well unless they spend some time each day in taking exercise. Grown persons need to spend at least an hour or two every day at some kind of exercise, but children need to exercise for three or four hours a day.

The Best Exercise. — One of the best kinds of exercise is doing useful work, such as chores in the house and barn. You will take exercise if you work with

carpenters' tools, or hoe a garden, or sweep a room, or rake a lawn, or care for hens and horses. All such exercise will help your mind as well as your muscles, and will also teach you to do useful work.

GOOD EXERCISE

One of the best kinds of exercise is that of doing useful work, such as raking a lawn or doing errands.

If you have to run errands or help your parents around the house or barn, you will get exercise without thinking about it. If you have no work to do, take your exercise by going on long walks, or by working in a gymnasium, or by playing games in which you run a great deal.

Swimming. — Swimming is good exercise, for it puts nearly every muscle in the body to use. The water also cleanses and refreshes the body.

Some persons have a fear of the water if they do not know how to swim. When an accident happens, and they or their friends are thrown into deep water, they are too frightened to help themselves or any one else. On one hot day in summer twenty-two persons were drowned in different parts of New England while they were bathing for pleasure. Nearly all of these deaths could have been prevented if the bathers had known

how to swim. Learn to swim, so that you will be cool and helpful when an accident happens on the water.

Rowing. — Rowing a boat will exercise most of the muscles of the body. By rowing you will learn how to handle a boat, and will know what to do if you should need to go out on the water.

Play. — Exercise means not merely the use of the muscles, but the pleasant use of the mind also. When you do not enjoy an exercise, you sometimes feel worse than if you had not taken it. Even though an interesting game may require you to think, and to work hard with your arms and legs, yet you will enjoy it while you play, and afterward you will feel refreshed in mind and body.

Those games are best that require quick thought as well as strength. Such sports as baseball, tennis, and skating, are enjoyable forms of exercise which will train your mind to think quickly, and your body to become strong and graceful.

Gymnasium. — Many schools have gymnasiums in which a pupil can exercise any set of muscles that he wishes. If any part of the body is weak, that part may be exercised and strengthened. If the arms are weak, they may be exercised by pulling upon weights. If the back is weak, it may be strengthened by exercising on a rowing machine.

Outdoor Exercise. — While you are taking exercise, you breathe a great deal of air into your body. You

HAPPY EXERCISE AT RECESS

Take your exercise out of doors if possible.

get the greatest good from exercise when you take it out of doors where the air is pure and free from dust. This is one of the reasons why baseball and running games are among the best kinds of exercise.

Too Much Exercise. — If you exercise until your muscles are tired out, you will have no strength left for work. Schoolboys training for athletic contests often run hard or lift heavy weights until they have used up their strength. Then both their bodies and their minds grow weaker instead of stronger. But your feelings will usually tell you whether or not exercise is helping you. If any exercise that you take

makes you so tired that a short rest does not refresh you, that exercise is too hard for you.

Alcohol and Strength. — Because strong drink makes the heart beat hard and the blood flow fast, a person who drinks it may feel strong. He is no stronger than he was before he took the drink, for the alcohol is like a whip that gives the body no strength for doing the work. So far from being stronger, a person is really weaker and less able to use his strength because he has taken the drink.

QUESTIONS

Of what is the lean meat of an animal's body composed?
What substance in meat makes it tough?
What part of the flesh produces the motions of the body?
Where is a good place on the body to feel a muscle acting?
What is a tendon?
Where may tendons be felt in the body?
Of what use are the bones?
How may a person who has a broken bone be helped?
How are the bones joined together in the body?
What is a ligament?
What happens to the ligaments when a joint is sprained?
What should be done for a sprain?
Give two reasons why a person should take exercise.
From what do muscles get their power to work?
How does exercise refresh the body after a person has been sitting still for some time?
How may exercise help a person to have an erect body?
What are some ways in which exercise may help the mind?
What are some kinds of exercise that train the mind as well as the body?
Give some reasons why every person should learn to swim.
Name some uses of a gymnasium.

What harm may be done by exercising too much?
What effect does alcohol have on a person's strength?

For the Teacher. — The subject of exercise is one to be treated principally on the playground and in the gymnasium, but there are a few fundamental principles to be learned in the classroom.

This chapter describes the apparatus with which the body performs voluntary movements. It takes up the bones and joints, as well as the muscles, for most movements consist in bending joints.

The basic principles of the hygienic effects of exercise are stated in the paragraph on "Exercise and Health," page 222. Activity of every part of the body promotes good health. Bones and muscles constitute about two thirds of the weight of the body, and their activity causes all other parts of the body to become active. Almost the only practical way to increase the activity of the organs of digestion, circulation, and respiration is by exercising the muscles. Brain action is essential in exercise. What is called muscular fatigue consists largely in exhaustion of the brain cells.

Muscle training involves the training of the motor areas of the brain, and through them, of the whole brain. Games and other forms of muscular exercise develop those mental qualities which are of value in earning a living. The playground is a miniature world in which each pupil strives for success, with some schemers and some lazy ones who seek unfair advantages. Setting-up exercises, physical training, and athletics afford the teacher frequent opportunities to correlate mental and moral topics with exercise itself. Among the related topics which a teacher should emphasize are:

Team play, or adapting ourselves to others.
Prompt response to orders and signals.
Attention and concentration.
Fair play, honesty, and loyalty.
Generosity and self-control in both victory and defeat.
Serious responsibility for the credit and honor of self, the team, and the school.

The teacher also has a duty in teaching the pupils how to play games, and in directing them in organized play during recess periods. Games afford the teacher an excellent point of contact with pupils who are reticent or antagonistic in the schoolroom.

CHAPTER XXVI

THE BRAIN AND NERVES

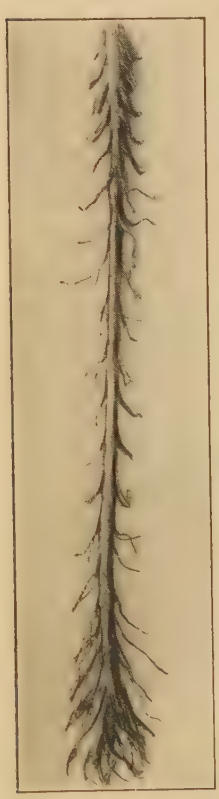
The Mind. — Each person has a body and a mind. The body alone is not the whole man, for it can do only what the mind directs. Neither is the mind the whole man, for it cannot think or act except by means of that part of the body which is called the *brain*.

The Nervous System. — The brain of a person is about the size of his two fists. It fills the whole top of the head above the eyes and ears. A long cord, called the *spinal cord*, extends from it down the inside of the backbone. Long threads of flesh, called *nerves*, go out from the brain and spinal cord to every part of the body. The brain, spinal cord, and nerves are called the *nervous system*.

A Human Brain
Side view, ¼ natural size.

Sensory Nerve Messages. — Nerves are like telephone wires, and are always carrying messages back

and forth between the brain or spinal cord and the rest of the body. The nerves carry to the brain messages of seeing, hearing, feeling, smelling, and tasting. By means of these messages the mind finds out what is going on outside of the body. Nearly all that a person knows about what is going on around him he finds out by seeing, or by hearing, or by feeling, or by smelling, or by tasting. Children at school get nearly all their knowledge by means of messages of sight and hearing.



HUMAN SPINAL CORD

(¼ natural size.) The strings on its sides are the ends of nerves.

The messages which the nerves carry to the brain are called *sen'sory* nerve messages. Receiving messages from the nerves is one kind of work which the brain does.

The Use of Pain. — Nerves also carry messages which tell the brain when a part of the body has been wounded or injured. Pain is a message telling you that something is wrong in the part which aches or smarts. If you had no pains and aches when you were hurt, you might lose an arm or leg before you would know of your danger.

A drug such as morphine eases pain because it prevents the brain from receiving the message of

pain. The drug does not cure the painful part, but it may deceive a person and make him think he is well when he no longer feels the pain.

Motor Nerve Messages. — Sending messages to the muscles, to tell them what motions to make, is a second kind of work which the brain does. These messages are called *motor* nerve messages. Whenever the hands work, the brain sends messages which direct the motions of the arms and fingers. A person works with his brain as well as with his muscles whenever he moves any part of his body.

Thinking. — Thinking is a third kind of work which the brain does. The brain keeps a record of the messages which it receives and sends out. This record is the *memory*.

The mind often looks over the memory records which are stored in the brain. This act of the mind is called *thinking*.

Where Brain Work Is Done. — Each part of the brain has its own kind of work to do. The back part of the brain receives messages of sight, hearing,

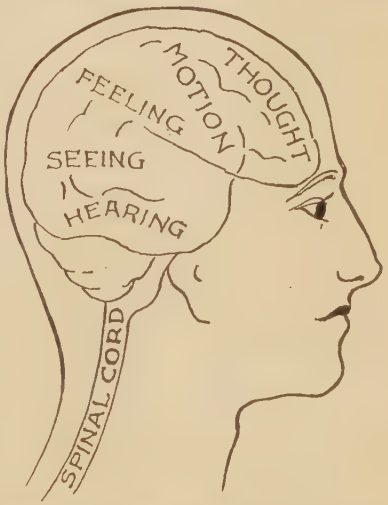


DIAGRAM OF THE WORK OF THE BRAIN
Each part of the brain has its own kind of work to do.

feeling, smelling, and tasting; the top of the brain sends out orders to the muscles; and the front part of the brain does the most of the work of thinking. Thus, when you look at an arithmetic, you use the back part of the brain; when you copy an example, you use the top part; and when you think how to do the example, you use the front part of the brain.

Tired Brains and Muscles.—When a muscle becomes tired, the part of the brain which directs its work also becomes tired. When the hands work, the brain becomes as tired as the muscles which move the hands. Playing ball for an afternoon tires the brain as much as it tires the arms and legs. When you feel tired after exercise, both your muscles and your brain are tired.

Hard exercise for a few minutes at recess will help to brighten the mind if it does not tire the muscles (p. 225). But exercise that tires the muscles will tire the brain also. Hard play before school often makes a pupil so tired that he cannot learn a lesson well. Practicing long and hard with an athletic team will tire the brain as well as the muscles.

Play and Brain Rest.—When one part of your brain is tired, it may rest if you change your work and use another part of your brain. When you play outdoor games at recess, you make use of the part of the brain which directs the muscles, and you give the thinking part of your brain a rest. The exercise of playing games also makes you breathe deeply, and causes your blood

to flow fast. When school is called again, you feel bright and refreshed.

Sleep.—You may easily rest your muscles by lying still, but often you will find it hard to keep the brain from thinking. One of the hardest of all things to do is to sit still and try not even to think.

The only time when the mind is at complete rest is during sleep. Then the mind almost stops acting, and the brain builds itself up and stores food for the next day's work. Every person must have sleep. The body can go without food longer than without sleep. A child ten years old needs at least ten hours of sound sleep each night. A grown person needs to sleep about seven hours daily. If you have had enough sleep, you will feel refreshed and ready to get up as soon as you wake up. If you are dull and feel like going to sleep after you have washed and dressed, you have not had enough sleep, or else you are sick. If you sleep well and wake up bright and refreshed, you are not likely to harm yourself by working as hard as you choose all day long.

Sitting up Late. — Children cannot work or play until late at night without being tired the next morning. If they sit up late, they will lose some of their sleep unless they sleep late in the morning. If you expect to spend an evening at a party or entertainment, take a nap in the afternoon before you go. Then you will be rested for the evening's work and will also get your full amount of sleep.

When you have lessons to learn in the evening, you will not be able to do them well if you are tired. Drop your work early in the evening and go to bed. The sleep will rest your mind, and in the morning you will be able to think clearly and to learn lessons which you could not understand in the evening.

Children are often cross and fretful in the evening because they are tired and do not know it. When bedtime comes, the place for you is in bed, even though you may not feel sleepy.

Some Causes of Wakefulness. — When a person is asleep, far less blood flows through the brain than while he is awake. Anything that makes a large quantity of blood flow through the brain will make the mind active and prevent sleep. For this reason working or playing hard just before going to bed is often a cause of wakefulness. Amuse yourself after supper in some quiet way, as by looking at pictures. Then your mind will become quiet, only a little blood will flow through your brain, and you will easily fall asleep.

Some persons do not sleep well because their muscles do not become tired. Those who work the hardest with their muscles can usually sleep the best.

Impure air in a bedroom is often a cause of poor sleep. Keeping a bedroom window open all night is a great help in sleeping soundly.

Sleep and Eating. — A common cause of lying awake is wrong eating. If the stomach does not digest food well, there will often be a headache, or other uncom-

fortable feeling, which will prevent sleep. Poor sleep and bad dreams are often caused by wrong eating. Sweets, or desserts, or other fancy dishes at night, may cause indigestion and prevent sleep.

Narcotics. — Many kinds of drugs, such as opium and morphine, prevent the brain and nerves from acting. If a person is in pain, they prevent the brain from feeling the pain. They may almost stop the brain from acting, and so they may put a person to sleep. But such drugs are dangerous, and are safe only when they are given by a careful doctor (p. 127).

Alcohol. — If a person's brain is benumbed with strong drink, we say that he is drunk. His brain cannot send out motor messages properly, and so he staggers in his walk. He cannot feel sensory messages keenly, and so he may injure himself without knowing it. He cannot think well, and so he may act foolishly.

Tobacco. — The brain of a boy is easily made tired, and is quickly harmed by those things which may have little effect on a grown man. Any use of tobacco is harmful to boys.

One of the worst effects of tobacco is that it hinders brain growth. If a man is injured by tobacco, he may get well after he stops its use. But a boy cannot make up for the loss of growth caused by tobacco. Boys who smoke cigarettes will almost surely be behind other boys in school work. When they grow up and go out to work for themselves, they will be unable to obtain high positions in life.

QUESTIONS

1. What is the brain?
2. What is the spinal cord?
3. What are nerves?
4. What are sensory nerve messages?
5. Of what use is pain?
6. What are motor nerve messages?
7. What makes the muscles of your arm move?
8. How does muscular work tire the brain?
9. What is the memory?
10. What is a narcotic? Name some narcotics.
11. Why does a drunken man stagger in walking?
12. What effect does tobacco have on brain growth?
13. Name some ways in which the mind may become rested.
14. How does play at recess rest the brain?
15. Of what use is sleep?
16. How much sleep does a ten-year-old child need?
17. If you expect to be out for an evening, how may you get all the sleep that you need?
18. What are some of the usual causes of a person's wakefulness?
19. How may eating keep you awake?
20. How does exercise help a person to sleep?

For the Teacher: While the subject of the nervous system is too deep for younger pupils, yet they should learn the fundamental facts regarding its structure and action. It is both correct and helpful to compare the nervous system with a telephone system.

There is no need to go into details regarding the spinal cord and its relation to the brain. Classify nervous actions into three groups:

1. Sensory messages, or those going *to* the brain.
2. Motor messages, or those going *from* the brain.
3. *Thinking*, or actions taking place *in* the brain.

Emphasis is to be placed on the words *to*, *from*, and *in*. The words sensory, motor, and thinking stand for types of nervous actions, and are taken from a prominent conscious action in each group.

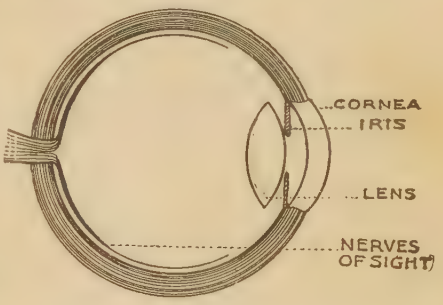
Emphasize three practical points:

1. The use of pain.
2. Brain fatigue and tired muscles.
3. The need of sleep.

CHAPTER XXVII

SEEING AND HEARING

The Eye. — The eye is a hollow globe filled with a clear liquid. Light enters it through a round window, called the *cornea* (kôr′nē-ă), and passes through a lens that is like the lens of a photographer's camera. The lens causes the light to form a picture upon nerves which lie in the back part of the globe. The feeling which the light produces in the nerves is called sight.



THE EYE

Diagram showing its principal parts.

A colored curtain, called the *iris* (ī′rĭs), hangs in front of the lens, and gives the eye its color. The iris has a round hole, called the *pupil*, which becomes large in a dim light and small in a bright light, in order to regulate the amount of light which enters the eye. The pupil appears black, because the inside of the eye has a dark-colored lining.

Dirt in the Eye. — The eye is covered with two lids which protect it from dust and dirt. A liquid called

tears runs under the lids to keep the eye clean. When you have a bit of sand or other hard dirt under a lid, your eye itches or smarts. Do not rub the lid, for rubbing might make the dirt scratch the eye. Lift the lid, and hold it away from the eyeball for a moment so that the tears may wash the dirt away. If the dirt does not come away, let some one lift the eyelid and pick out the dirt with the corner of a clean handkerchief.

Bathing the Eyes. — Dust and tears sometimes dry on the eyelashes and on the edges of the lids. The dirt may contain disease germs which make the lids sore and tender. One great reason for washing the face often is to wash dirt and disease germs from the eyes.

Sometimes the eyes may smart and become red, and a white matter may run from them. The soreness is often caused by disease germs growing under the lids. A little borax dissolved in the water with which the eyes are washed will help to kill the germs.

The eyes of babies often become sore because they are not kept clean. Flies crawling over their eyes may leave disease germs on them. Many persons are blind because their eyes were not kept clean while they were babies. A baby's eyes will not be likely to become sore if they are kept clean.

Poor Sight. — The eyes of some persons do not form clear pictures of what they try to see. These persons cannot see well. Their eyes soon become tired, and they often have headaches. Many school children

have headaches because they have to strain their eyes in their studies. Some are backward because they have poor sight, and no one is aware of the fact. The sight of every pupil should be tested.

Testing the Sight. — The sight may be tested by finding the greatest distance at which large, plain letters can be read. Test one eye at a time while the other is kept closed. The following table gives the distances at which letters of various sizes may be read by a person with good eyesight:

Height of Letter	Distance at Which it may be Read
$3\frac{1}{2}$ inches	200 feet
$1\frac{3}{4}$ inches	100 feet
$1\frac{1}{4}$ inches	70 feet
$\frac{7}{8}$ inch	50 feet
$\frac{3}{4}$ inch	40 feet
$\frac{1}{2}$ inch	30 feet
$\frac{3}{8}$ inch	20 feet

A record of a person's eyesight may be made in the form of a fraction in which the numerator is the greatest distance at which a letter can be read by this person, and the denominator is the greatest distance at which it can be read by some one with good eyesight. If a person has to stand only ten feet away from a card in order to read letters $\frac{3}{8}$ inch high, that person sees only $\frac{10}{20}$, or one half, as well as he should.

Eyeglasses. — A person who has to hold a book less than a foot from the eyes while reading is *near-*

sighted. He may greatly improve his sight by wearing glasses. If they are not worn, the eyes will be strained.

If a person has to hold a book at arm's length when reading, he is *farsighted* and needs glasses. Most old persons are farsighted.

The front parts of the eyes of some persons are curved unevenly. This trouble is called *astig'matism*. These persons see things blurred, just as a person with good eyesight would see them blurred when looking at them through a wrinkled window glass. They often have headaches because they tire the muscles of their eyes in trying to see clearly. They may improve their sight and stop their headaches by wearing the proper glasses.

If you cannot see as well as other persons, something is the matter with your eyes. You cannot improve the sight by straining the eyes. Tell your teacher or your parents, and ask them to help you to get fitted with glasses.

Eyeglasses that stay in place by pinching the nose often produce pains. Spectacles do not pinch the nose, but are held in place by bows which loop over the ears.

Cross-eye. — If a person does not turn both eyes toward an object at which he looks, we say that he is *cross-eyed*. Those who are cross-eyed cannot see well, for everything appears double to them. Their sight may be greatly improved by a doctor.

The Proper Light. — A wrong light is often a cause of eye pain and eyestrain. Reading by a dim light,

or by one that is unsteady, will strain the eyes and often cause a headache.

If you face a strong light while you read, your eyes will be dazzled and soon become painful. If you place your seat where the window or lamp will be on your left side, the light will be in the best position for reading or studying.

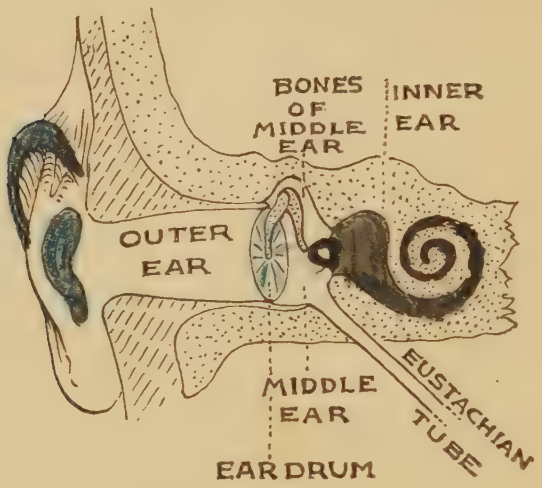
Granulated Eyelids. — Sometimes the eyelids look red on the inside, and feel as if they were covered with grains of fine sand. This trouble is called *gran'ulated eyelids*. One form of granulated eyelids is infectious, and is called trachoma (tra-kō'ma). It may be caught from towels or handkerchiefs that have been used by some one who has trachoma. The disease is becoming common in cities. It is dangerous and may cause blindness, and yet it may easily be cured. Every child who has it should be taken at once to a doctor.

The Ear. — The ear consists of three parts, which are called the outer ear, the middle ear, and the inner ear.

The outer ear consists of a shell of flesh, and a short tube which extends into the side of the head. The tube ends at a thin skin which is called the eardrum, because it is stretched over the end of the tube like a drumhead.

Behind the eardrum is a small hollow space called the *middle ear*. The middle ear is filled with air and is crossed by a chain of three tiny bones that reach from the eardrum to another space called the *inner ear*.

The inner ear is shaped like a snail shell, and is filled with a clear liquid. The nerves of hearing are stretched across it like the strings of a piano. The middle ear



THE EAR

Diagram showing its principal parts.

and the inner ear are both hollowed out of hard bone, and therefore are not likely to be injured by blows and jars.

How We Hear. — Sound is caused by air moving in waves. A very loud sound, such as thunder, is produced by great air waves which strike against windows and doors and cause them to shake and rattle. When a sound is heard, air waves strike against the eardrum and move the bones of the middle ear, and the liquid of the inner ear. The nerves of the inner ear feel the

motion as sound. A person who is hearing a sound is really feeling the motion of the liquid in the inner ear.

Testing the Hearing. — Some school children are dull and inattentive because they are deaf, and neither they, nor their parents, nor their teachers have discovered the deafness. In many schools the hearing of every pupil is tested.

You may test the hearing by finding the greatest distance at which a whispered word may be heard in a quiet room. Test each ear separately while the other ear is closed with a finger. The person testing the hearing pronounces a number and the person tested repeats it to show that it is understood. A person with good hearing can understand a loud whisper in a quiet room at a distance of about 25 feet.

The record of a person's hearing may be put in the form of a fraction in which the denominator is 25, and the numerator is the greatest number of feet at which a whisper is understood. If a person can understand a whispered word at no greater distance than five feet, that person hears only $\frac{5}{25}$, or $\frac{1}{5}$, as well as he should.

Eustachian Tube. — A small tube, called the *Eustachian* (ū-stā′kĭ-an) *tube*, lets air pass from the throat into the middle ear. Trying to blow the nose hard while holding the nostrils closed may force so much air into the middle ear that the eardrum may bulge out. Then the hearing will be dulled, because the eardrum will not move freely. When a person has a cold or a

sore throat, the ears often buzz, and there is a slight deafness, because the swelling in the throat stops up the Eustachian tube, and does not let air pass into the middle ear. Most persons who are deaf are made so by adenoids or other throat troubles which stop up the Eustachian tube.

Earache. — The middle ear is moistened with a small amount of liquid. If the liquid cannot run out through the Eustachian tube, it may fill the middle ear full and press hard upon the eardrum. This causes an earache. The eardrum may burst and let the liquid run out, and then the pain stops. But the ear is likely to be deaf, and matter is likely to run from it for days or weeks afterwards.

If you have an earache or a running ear, you are in danger of being deaf for the rest of your life, but if you go to a doctor, you can usually be cured and your hearing can be saved.

Adenoids and Earaches. — Most children who have earache and running ears have adenoids growing in their throats (p. 56). The first thing to do in order to cure an earache or deafness is to have the adenoids taken out.

Earwax. — The tube of the outer ear produces a brown wax which protects it from injury. Persons often force the wax deep into the tube when they try to remove it, and in that way they make themselves deaf. If the wax is not touched, all that is not needed in the ear will usually drop out.

Voice. — In order that words may be heard distinctly, their sounds must be made clearly and distinctly. The sounds of the voice come from the upper part of the windpipe just below the back end of the tongue. They are made by forcing air between two bands of flesh called *vocal cords*. The sounds are made pleasing, and are formed into words, by the nose, mouth, tongue, and teeth. You must have all these parts of the body in good order if you would have a good voice.

A person learns to speak by listening to the words of others. Those who cannot talk are usually too deaf to hear. They may learn to talk if they go to a school for the deaf.

What is called a tongue-tie, or a cord hindering the movements of the tongue, is very seldom seen. Very few persons with indistinct speech have anything the matter with their tongues or throats. Nearly every person can easily learn by practice to speak distinctly.

A Pleasing Voice. — If you mumble your words and speak indistinctly, those who listen to you will have to try hard to understand you. If your voice is shrill and unpleasant, it will annoy other persons and make them uncomfortable. Sick persons are often made worse by the loud talk of visitors and nurses, but every one likes to hear a voice that is soft and pleasant. One of the best recommendations that a boy or girl can have is the habit of speaking clearly and pleasantly.

QUESTIONS

In what respect is the eye like a photographer's camera?
Of what use are the eyelids? Of what use are tears?
How may a speck of dirt be removed from under the eyelid?
What care should be given to the eyes when they become sore?
How does wearing glasses often help a headache?
What is nearsightedness? farsightedness? astigmatism?
When should glasses be worn?
How may the sight be tested?
What is trachoma?
How should the light be arranged for reading?
With which part of the ear is sound heard?
Why do the ears often buzz when the nose is blown hard?
How does throat trouble cause earache and deafness?
How may the hearing of a person be tested?
Why does a deaf baby not learn to talk?
How is the sound of the voice made?
What has a pleasant voice to do with health?

For the Teacher. — A camera will illustrate the subject of vision. Bring a focusing camera to school, and show the pupils the image on the ground glass, and the method of focusing.

Test the sight of the pupils. Standard test cards may be bought; but if none are available, posters and the headlines of newspapers may be used by measuring the heights of the large letters according to the table on page 239.

Make a practical application of the subject of lighting. See that the windows of the schoolroom are not obstructed, and that the desks are so arranged that each pupil gets his share of light, and yet no one faces a strong light.

Observe the pupils while they are reading, and note the faulty use of their eyes. Assist those with defective sight to obtain glasses or other means of relief.

Emphasize the relation of the nose and throat to deafness.

Test the hearing of the pupils and help the deaf to secure proper treatment. Emphasize the need of taking treatment for running ears and deafness. Warn the pupils against pulling or boxing the ears, or making loud noises near the ears.

The voice is closely related to hearing. Many children are wrongly charged with inattention or deafness, when the trouble is defective enunciation by the speaker. Clear enunciation is of importance to all on account of the universal use of the telephone. Stammering and stuttering are nervous affections, and their treatment consists in gentle training.

GLOSSARY

Absor'bent cotton, cotton prepared for dressing wounds.
Ad'enoids, soft growths in the upper part of the throat behind the nose.
Al'cohol, a colorless liquid used in manufacturing and as a fuel. It is also found in strong drink.
Antitox'in, a substance which will destroy the poisons of disease germs, such as those of diphtheria or lockjaw, when they are in the blood.
Arte'rial blood, blood containing a large amount of oxygen. Most of the blood in arteries is arterial.
Ar'tery, a blood tube which carries blood away from the heart.
Artifi'cial respira'tion, causing air to pass into and out of the lungs of a person who seems to be lifeless.
Astig'matism, an unevenness of the surface of the eye, causing blurred sight.
Au'ricles, the two thin-walled chambers in the large end of the heart. They receive blood from the veins.

Bacte'ria, the smallest known forms of living things. Some cause decay and others produce diseases.
Band'age, a dressing wrapped around a wounded part.
Bile, the bitter yellow liquid produced by the liver.
Blis'ter, a collection of the liquid part of the blood under the outer layer of the skin.
Board of Health, a body of officers who have charge of the prevention of infectious disease, the purity of food supplies, and other matters affecting health.
Brain, the seat of the mind. It fills the upper part of the head.
Bron'chi, the tubes through which air passes from the windpipe to the lungs.

Canning, preparing food by heating it and sealing it in air-tight cans in order to prevent it from spoiling.
Cap'illaries, the microscopic tubes which carry blood from the arteries to the veins.
Car'bon diox'ide, a colorless gas formed by most fires, and by the oxidation in the body.
Cells, the separate, living parts of which the body, or an organ, is composed.
Cesspool, an underground tank from which sewage soaks into the soil.

Circula'tion, the flow of blood through the body.
Clot, blood in a jellylike form.
Cocoa (kō'kō), the ground seeds of the cacao tree; chocolate.
Coffee, the roasted seeds of the coffee shrub.
Cold, a mild form of infectious disease.
Commu'nicable disease, a disease which may be spread, or communicated, from the sick to the well.
Connec'tive tissue, the tough, white fibers that hold cells in place.
Contact, a person who has been near one who has an infectious disease, and is likely to have caught the sickness.
Conta'gious diseas'es, diseases which may be caught by being near the sick.
Cooking, heating food in order to make it ready for eating.
Corns, tender, thickened spots upon the outer layer of the skin on a toe or other part of the foot.
Cor'puscles, the solid bodies that float in the liquid part of the blood.
Culture, disease germs planted in a tube and growing there.

Dan'druff, loose scales of skin that fall off from the scalp.
Decay', the destruction of once living substances by bacteria or molds.
Den'tine, the bony substance of which most of a tooth is made.
Diges'tion, the change of food into forms that may enter the blood.
Diphthe'ria, an infectious disease caused by diphtheria germs. It usually produces a thick brown membrane, or patch, in the throat.
Disease germs, microscopic plants and animals which grow in a living body and produce a disease.
Disinfec'tion, destroying disease germs in a substance.
Distilla'tion, separating alcohol from a boiling liquid by collecting and cooling the steam.
Dressing, a covering for a wound.
Drug, a poisonous substance used as medicine, especially one which produces sleep.

Eardrum, the thin sheet of flesh at the inner end of the tube of the outer ear.
Earwax, a brown, waxy substance which is formed in the tube of the outer ear.
Enam'el, the hard, white outer part of a tooth.
Epider'mis, the thin, outer layer of the skin.
Esoph'agus, the tube down which food is swallowed.
Eusta'chian tube, a small air tube leading from the throat to the middle ear.

Farsight'edness, the power to see distant things clearly, but not those near to the eye.

Fermenta'tion, changing sugar in a liquid to alcohol and carbon dioxide gas. The gas makes the liquid appear to be boiling.
Fever, a sickness in which the body is too warm. It is usually caused by disease germs.
Filter, a tank of sand for removing solid impurities from water.
Food, any substance which the body may safely use for building itself up, or for producing heat and power.
For'malin, a colorless liquid used for killing disease germs.

Gas'tric juice, the liquid that digests food in the stomach.
Germs, the plants or animals that grow in a living body and produce diseases; bacteria.
Gland, a collection of cells arranged in the form of a tube, and manufacturing a substance out of blood.
Gran'ulated eyelids, a disease of the inner surfaces of the eyelids, caused by disease germs; trachoma.

Heart, the muscular pump that forces blood through the body.
Hu'merus, the bone reaching from the elbow to the shoulder.
Hy'giene, the study of the care of the body.

Infec'tious diseases, those forms of sickness which a person may catch from some one who is sick. They are caused by microscopic plants or animals growing in the body.
In'growing nail, a toenail whose edge is buried beneath the flesh pushed against it by a tight shoe.
Intes'tine, the long food tube below the stomach.
I'odine, a brown substance which is dissolved in alcohol and used for killing disease germs on the skin around wounds.
Isola'tion, keeping a diseased person away from others in order to prevent the disease from spreading.

Kid'neys, two red masses of flesh which remove waste matters from the blood.

Lig'ament, strong bands of flesh which bind bones of a joint together.
Liv'er, the large, red mass of flesh which receives digested food from the intestine and forms bile.
Lock'jaw, a dangerous disease producing a contraction of the muscles. It is caused by disease germs which enter a wound.
Lungs, the spongy masses of flesh in which the blood takes oxygen from the air.

Mag'got, a young house fly in its wormlike stage.
Mala'ria, a sickness in which the body at first is cold and within an

hour is too warm. It is caused by disease germs which are placed in the body by mosquitoes when they bite.

Measles, a children's disease in which the child seems to have a common cold for several days, and then red spots appear on the skin.

Molars, the double teeth. They have flat surfaces for grinding food.

Molds, microscopic plants which often produce a furry growth on food and clothing.

Motor nerve, a nerve which carries a message away from the brain or spinal cord.

Mu'cus, the liquid produced by the lining of the nose, throat, and other hollow parts of the body.

Muscle, a bundle of cells that produces motion in the body; lean meat.

Narcot'ic, a drug that dulls the mind and produces sleep.

Nearsight'edness, sight in which objects must be held near the eye in order to be seen.

Nerves, long threads or strings of flesh which carry messages between the brain or spinal cord and the rest of the body.

Nervous system, the brain, spinal cord, and nerves.

Nic'otine, the principal poisonous substance in tobacco.

Oil glands, tiny pockets in the skin in which an oil is formed for softening the skin.

O'pium, the dried juice of certain plants. It is a narcotic drug.

Organ, a part of the body which does a special kind of work.

Oxida'tion, the joining of oxygen to a substance. The burning in a stove is a rapid form of oxidation.

Ox'ygen, a substance that forms one fifth of the air, and unites with other substances in a fire and other kinds of oxidation.

Pan'creas, a mass of flesh in which one of the digestive fluids is formed.

Parame'cium, a microscopic animal consisting of a single cell.

Pas'teurizing, heating milk to a temperature less than boiling in order to kill the bacteria it may contain.

Perspira'tion, the liquid which comes from the skin when the body is too warm; sweat.

Physiol'ogy, the study of the actions of a living body.

Pro'tein, the substance, like the white of an egg, which forms the living part of every plant or animal.

Pupil, the round hole in the iris which admits light into the eye.

Pus, the creamy matter which flows from sore wounds. It is composed of white blood cells that have been killed by bacteria.

Quar'antine, keeping persons who are sick with an infectious disease away from other persons.

Radius, the bone on the thumb side of the arm below the elbow.
Red blood cells, the red bodies which float in the blood. They carry oxygen from the lungs through the body.
Respira'tion, breathing, and oxidation in the body.

Sali'va, the digestive liquid of the mouth.
Scarlet fever, an infectious disease in which the throat is sore and the skin red.
Scur'vy, a disease in which the gums and bones are sore and the body is weak. It is caused by a lack of fresh vegetables and fruit in the food.
Sen'sory nerves, nerves which carry messages to the spinal cord and brain.
Se'rum, the liquid part of the blood.
Sew'age, waste water and slops from bathrooms, kitchens, and laundries.
Sew'age dispos'al, destroying the solid substances and disease germs in sewage.
Sewer, a pipe for carrying away sewage.
Shock, the dizziness, weakness, and faintness which are caused by an injury.
Spinal cord, the cord of nerve matter that lies in the backbone.
Spores, the dust that flies from mold. Each particle is a seedlike ball.
Stim'ulant, a substance that will rouse the body to greater action.
Stom'ach, the enlarged part of the digestive tube which food enters after it has been swallowed.
Strong drink, any drink containing alcohol.

Tan, a dark substance formed in the skin by exposure to bright sunlight.
Tea, dried leaves of the tea plant.
Ten'don, the strong, white cord which connects a muscle to a bone.
Tobacco, a plant used for smoking and chewing, and as snuff. It contains a narcotic poison.
Tonsilli'tis, a soreness of the tonsils, with fever.
Ton'sils, two masses of flesh growing in the sides of the throat. They are often the cause of sickness.
Tra'chea, the tube carrying air from the throat to the lungs; the windpipe.
Tracho'ma, an infectious form of granulated eyelids.

Tuberculo'sis, a disease caused by the germs of tuberculosis growing in the body; consumption.
Ty'phoid fever, a disease of the intestine caused by the growth of typhoid bacteria.

Ul'na, the bone on the little finger side of the forearm.

Vein, a blood tube that carries blood toward the heart.
Venous blood, blood that contains but little oxygen. Most blood in the veins is venous.
Ventila'tion, changing the air of a room for fresh, outdoor air.
Ven'tricles, the two cavities in the lower end of the heart.
Villi, the velvet-like projections on the lining of the intestine.
Vin'egar, a sour liquid produced by bacteria growing in cider or wine.
Vi'tamins, food substances which the body needs in order to make good use of its other foods. They are abundant in milk, green vegetables, and fruit. Scurvy is caused by a lack of one kind of vitamin.
Vocal cords, two flat bands of flesh at the upper end of the windpipe by which the sound of the voice is produced.

Waste matter, oxidized substances in the body.
Wet dressing, a wound dressing which is kept wet with a substance which will kill disease germs.
White blood cells, the white bodies which float in the blood. They destroy disease germs.
Whooping cough, a children's disease caused by the disease germs of whooping cough, and producing spells of hard coughing.
Wig'gler, a young mosquito while it lives in the water.

Yeast, microscopic plants that change sugar to alcohol and carbon dioxide.
Yellow fever, an infectious disease, spread by mosquitoes.

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